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THE MANAGEMENT OF RUPTURED ABDOMINAL ANEURYSMS.

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MOST abdominal aneurysms are symptomless; they are usually not diagnosed in life, and are unassociated with the immediate cause of death. This is illustrated by the 20,201 autopsies performed in the Mayo Clinic (Sommerville *et alii*, 1959) during the period from 1925 to 1954; 172 non-infected atherosclerotic abdominal aneurysms were discovered, and of these only 31 had ruptured.

The onset of rupture is characterized, in the majority of cases, by lower abdominal pain, felt particularly to the left side of the umbilicus, and sometimes referred to the back, the flanks, the sacrum, the iliac crests or the testicles. The condition may, on occasions, closely simulate a prolapsed intervertebral disk, with pain referred down the leg. The pain reaches its maximum intensity in a few hours; it is colicky, intermittent or constant in nature and is associated with a varying degree of collapse. Severe shock is an initial symptom in about half the cases and death is delayed for 24 hours or more in almost three-quarters of the cases (Barratt-Boyes, 1957). That patients survive some time from the initial leak is possibly due to the plugging of the mural breach by the soft, laminated clot which lines the cavity of the aneurysm, together with the resistance to the continued extravasation of blood by the peritoneum coating the posterior abdominal wall. Pain arising from an aneurysm is an important prognostic sign; it is not generally possible to distinguish between the pain of rupture and the pain of an expanding aneurysm. In Sommerville's series 27 patients had complained of abdominal pain, usually for less than a week; of these 24 had a ruptured abdominal aorta. Pain associated with a palpable aneurysm becomes therefore an urgent indication for operation. In a few cases the aneurysm may rupture into the duodenum. Even so some patients can be salvaged (Voyles and Moretz, 1958).

The prognosis of acute rupture of an aortic aneurysm in the absence of surgical intervention is virtually hopeless, although occasional cases are reported of survival for some years without treatment (Estes, 1950; Barratt-Boyes, 1957). Resection of the diseased vessel is, therefore, a surgical emergency and although many of these patients have other clinical manifestations of athero-

sclerosis, they can, in successful cases, resume an active life.

The following four cases are illustrative of the management of ruptured abdominal aneurysms, heralded by severe abdominal pain and undiagnosed prior to rupture.

Reports of Cases.

CASE I.—A male, aged 63 years, was admitted to hospital with a history of a sudden onset of pain over the left iliac crest and over the upper part of the sacrum. These symptoms began while he was playing bowls 48 hours prior to his admission, and continued unabated until his admission, being accompanied by sweating, faintness and nausea. For the last year the patient had been complaining of intermittent claudication in both calves at 50 yards. Two years previously he had suffered from a possible posterior inferior cerebellar artery thrombosis. He was examined after the recent onset of severe pain by his local practitioner, who found a large, pulsatile mass in the abdomen and correctly diagnosed a ruptured abdominal aortic aneurysm.

On examination the patient was seen to be confused and in some distress, but he had withstood an ambulance ride of 20 miles without ill effect. His temperature was 100·4° F. and his pulse rate 90 per minute. His respirations numbered 22 per minute and his blood pressure was 220/150 mm. of mercury. Examination of the ocular fundi and the peripheral vessels confirmed the presence of generalized atherosclerosis. A large, pulsatile mass, 10 cm. in diameter, was present in the abdomen just to the left of the umbilicus. The mass was tender, and there was slight guarding of the abdominal wall overlying it, but no rigidity was present. Bowel sounds were absent, but a soft systolic murmur was heard over the abdominal mass. Both femoral pulses were present and equal. Rectal examination revealed slight tenderness anteriorly. The patient was disturbed as little as possible, and in view of his high diastolic pressure an attempt was made to reduce this with heavy sedation. Intramuscular injections of "Omnopon" and promethazine successfully reduced it to 170/120 mm. of mercury, and the patient was taken to the theatre some six hours after his admission to hospital.

A mid-line incision was made, extending from the pubis to the xiphisternum. The small intestine was packed off into the upper abdomen; a large hæmatoma was revealed, to the left of and overlying the abdominal aorta, extending from the bifurcation to the level of the renal arteries. The hæmatoma contained approximately 800 ml. of blood. On its removal a fusiform atherosclerotic aneurysm involving the distal part of the aorta was revealed, with a necrotic punctured area 2 to 3 cm. in diameter on the anterior surface. The actual hole through which perforation had occurred was 2 to 3 mm. in diameter in the centre of the necrotic patch. Both common iliac vessels were relatively uninvolved. The aorta was transected and excised and a "Dacron" tube graft, 14 cm. long, was inserted between the proximal and distal ends.

Immediately after the operation the peripheral pulses were palpable, and the patient's course was uncomplicated except for a paralytic ileus which lasted 48 hours, and a subacute small-intestine obstruction which occurred on the tenth day and was relieved by intravenous infusion and gastric suction.

Macroscopic examination of the aorta showed it to be 14 cm. in length and dilated up to 9 cm. in circumference. Thick, laminated clot was adherent to its wall, which was heavily atheromatous and calcified. On microscopic examination the intima was seen to be thick and disorganized by atheromatous deposits, some of which were calcified. The media contained fibrosis and there was a moderate degree of chronic inflammatory-cell infiltration in the outer part of the media and in the adventitia. An atheromatous plaque was present in one of the small vessels in the adventitia. There was no true perivasculitis in the media. The inflammatory changes were no greater than those often seen in atheroma and the appearances were consistent with an atheromatous aneurysm.

The patient was discharged 18 days after his admission to hospital. An arteriogram was performed six weeks after the operation (Figure I[1]). This demonstrated a patent graft with some irregularity at its proximal end, possibly owing to some thrombus formation on and about the suture line. The common iliac and femoral arteries were rather larger in calibre than usual and showed some atheromatous changes.

[1] For Figures I and II see art-paper supplement.

The patient has been seen at repeated intervals since his discharge and it has been found that his blood pressure has steadily increased from 130/90 mm. of mercury to 235/120 mm. of mercury nine months after his discharge. He is asymptomatic and appears extremely well, carrying on his normal activities.

The interval of time between the rupture and the resection was about 50 hours. The recurrence of hypertension and its increase over a basal pre-rupture level is interesting. This may be due to the action of hypertensive factors already operating on the patient in the pre-operative period, or possibly to a partial renal ischæmia arising from graft encroachment or an embolism, producing a "Goldblatt" kidney. From the appearance of the aortogram there seems to be some thrombosis present at the proximal anastomosis which may extend up to the renal artery and narrow its lumen.

CASE II.—A male, aged 72 years, had been previously fit, when, 12 hours prior to his admission to hospital, he suddenly collapsed, with a marked pallor and some abdominal pain radiating up into the chest. His general health and energy had been deteriorating for the past 2 to 3 years and he had noticed a nocturia (2 to 3 times a night) for the past few months. On admission to hospital he was rousable, but was not able to give a history. The pulse rate was between 120 and 140 per minute, the peripheral pulses were weak and the extremities were cold and cyanosed. The blood pressure was recorded as 100/60 mm. of mercury. On examination a large, pulsatile mass was felt to the right of the mid-line above the umbilicus. Both femoral pulses were present and bounding, and a harsh, systolic bruit could be heard over them.

At operation the infrarenal part of the aorta and both common iliac arteries were involved in a large atherosclerotic aneurysm (maximum diameter 10 cm.), which had leaked on the left anterior side of its greatest blow-out, the blood leaking retroperitoneally down along the iliac vessels. The aneurysm was excised, with the involved aorta and iliac arteries, and a pantaloon graft was inserted with its legs running down below the inguinal ligaments to be anastomosed to the femoral arteries. Four litres of blood were administered during and after this procedure. After the operation the patient's mental state never improved; the blood pressure ranged between 100/60 mm. of mercury and 150/100 mm. of mercury. His legs were pale and pulseless, and it was supposed that an extensive occlusion had occurred distal to the femoral anastomosis. The patient died 12 hours after operation, having failed to secrete more than a few millilitres of urine during the previous 24 hours. No autopsy was performed, but it was thought that the initial shock and the hypotension were such as to inflict an irreversible load on this patient's cardio-vascular reserve.

CASE III.—A female, aged 63 years, eight hours before admission, whilst going to bed, had been struck by a severe abdominal pain which radiated through to the back. For four years prior to this episode the patient had been treated for bilateral intermittent claudication.

On examination the patient was seen to be pale and distressed, being unable to give a detailed history. The blood pressure was 130/80 mm. of mercury, and in the abdomen was a pulsatile mass palpable above and around the umbilicus. The limb pulses were palpable in the groin, but not below that level. At operation eight hours after the onset of pain, a fusiform aneurysm was found, extending from 2 cm. below the renal vessels to the bifurcation of the aorta, approximately 12 cm. in diameter at its maximal circumference. The tear had occurred in its posterior aspect and the aneurysm was lined with several centimetres of layered blood clot. A tubular "Dacron" graft of 2·5 cm. diameter was inserted. After operation the blood pressure was maintained; the ileus was transient and the patient was discharged from hospital after 21 days. At a follow-up examination six months later she had regained her normal health, although she still complained of intermittent claudication.

CASE IV.—A male, aged 70 years, was heavily built and hypertensive, and had been known to be suffering from a symptomless abdominal aneurysm for the previous 18 months. Resection had not been advised at the time of the original diagnosis because the patient had already had a cerebral vascular episode and at least one coronary thrombosis. He had remained well until the evening of his admission to hospital, when he suffered severe abdominal pain radiating out into the right flank, linked with severe peripheral vascular collapse. On two occasions, once while

he was at home and again on his way to hospital, all his palpable pulses had disappeared, and the respiration had ceased for at least a minute on each occasion. On his arrival at the hospital two hours after the onset of the pain, the systolic blood pressure was 80 mm. of mercury (before the rupture it had been in the range of 220 to 250 mm. of mercury) and the patient was unconscious; a laparotomy was immediately performed. A hole admitting the tip of the little finger was found in the aneurysm, allowing bleeding over its anterior wall, and this was temporarily plugged, while the aneurysm, extending from immediately below the renal arteries to the bifurcation of the aorta, was resected and continuity was restored with a "Dacron" tube. There were about four pints of fresh blood in the peritoneal cavity and a great deal of hæmatoma in the mesenteries. The operative period was three hours, and 14 pints of blood were administered intravenously therein. Within an hour of the commencement of the operation the systolic pressure reached 200 mm. of mercury, and, although it fell to 130 mm. of mercury within a few hours of the patient's return to the ward, it had, within 24 hours, reached a height of 160 to 180 mm. of mercury, below which level it never fell until his death. The post-operative course was complicated by a period of acute pulmonary œdema, which was controlled by bronchial aspiration, morphine administration and small venesections. In the following 16 days the patient recovered some degree of responsiveness—sufficient to answer simple questions and to recognize his relatives. However, the urinary output never rose above 1000 ml., and although the patient was managed by a modified Bull regime, the blood urea-nitrogen level rose to 200 mg. per 100 ml., and the patient died of renal failure.

This operation may be regarded technically as a successful operation in a subject who was already suffering from severe parenchymal damage, particularly renal and cerebral, owing to periods of profound pre-operative hypotension.

Discussion.

Diagnosis.

The diagnosis of a ruptured abdominal aneurysm should provide little difficulty, although of the 18 cases described by Barratt-Boyes only seven were recognized before death. A pulsatile mass may have been previously discovered, or pain and collapse may be the first complaints.

On examination a tender, pulsatile lump is usually palpable above the umbilicus, over which there is a varying degree of abdominal guarding. In contrast to dissecting aneurysms, the femoral pulses are present and adequate, while on auscultation a soft or harsh systolic bruit may be heard over the abdominal and femoral vessels. The amount of hypotension and peripheral vascular collapse is variable. Certainly pain is the cardinal symptom and the diagnosis should if possible be made before profound collapse occurs. In Case I the patient had probably responded to the blood loss by a hypertensive reaction; in Case II the hypotension was severe and produced an oliguria, and finally cardiac arrest; in Case III the patient was collapsed but not profoundly so; in Case IV the patient had suffered severe pre-operative renal damage arising from his hypotension. Some help may be gained from a plain radiograph of the abdomen. In about one-third of cases, and especially in the case of aneurysms over 7 cm. in diameter, the characteristic curvilinear shadow may be detected (Figure II). Many of these patients may have a history and signs consistent with disseminated atherosclerosis, coronary disease, intermittent claudication or cerebrovascular accidents. One point is worth reemphasis: rupture is not usually followed by immediate death. In the majority of cases the patient survives for 24 hours or longer, during which period the diagnosis can be made and surgery undertaken.

Management.

It has been our policy not to replace the total suspected blood loss before operation unless the blood pressure is at a critically low level. After laparotomy the application of an abdominal clamp below the renal vessels greatly reduces the peripheral vascular bed and causes a marked rise in blood pressure. The urgent need to reexpand the circulatory volume occurs immediately before and after release of the clamp, and for this we use two or three separate pressure intravenous transfusions. Technically the operation is as for the uncomplicated abdominal aneurysm. An adequate incision is required (either mid-line or left paramedian) to expose the aorta and its division. If the aneurysm is bleeding at the time of exposure the bleeding is controlled by suprarenal pressure or by compression of the aorta against the vertebral column by a thumb or by an instrument. We have not found need for control of the thoracic aorta as recommended by Savage (1959) and Javid *et alii* (1955). Fortunately the majority of abdominal aortic aneurysms are below the renal vessels, and the infrarenal part of the aorta, which is not at this site adherent to the inferior vena cava, can be rapidly controlled by a nylon tape or a clamp. In emergency this can be reasonably safely done by finger dissection. However, some care may be needed to avoid the left renal vein, which is an anterior relation of the aorta at this site.

Before any further dissection of the aorta is commenced the iliac arteries must be isolated or controlled. Failure to do this may cause peripheral embolization from detached mural thrombus (Farrar *et alii*, 1956). The injection of 5-10 mg. of heparin in 20 ml. of isotonic saline into the iliac arteries distal to the clamp may help to prevent stasis thrombosis. The aorta, which usually ruptures at its maximally distended point anteriorly or posteriorly, is now doubly clamped above and the aneurysm is peeled back from the anterior common ligament, to which it may be toughly adherent. Large lumbar veins or close adherence to the inferior vena cava and the left common iliac vein may render this hazardous, and it is sometimes preferable to leave the right wall of the aneurysm attached to the vena cava rather than risk a troublesome dissection. However, we believe that it is better, if it is technically possible, to remove as much of the aneurysmal wall as possible, otherwise the inserted graft may be layered with a bed of necrotic tissue and become surrounded by a pool of liquefying debris. On the left side the inferior mesenteric vein and ureter must be watched for; the inferior mesenteric artery is usually already occluded and if patent its division at its origin carries minimal risk.

The graft to be inserted should preferably be of "Teflon" or "Dacron" and we prefer the crimped woven varieties, which by reason of their "give", are very adaptable to the varying diameters of aorta presented and have the great virtue of being sterilizable in the autoclave. In addition they can be cut to shape without any troublesome sealing of the ends. Pre-clotting of the "Dacron" type reduces the ooze on clamp release to a minimum. Homografts, nylon and polyvinyl alcohol sponge are less satisfactory because of "fatiguing" and the difficulty in their preparation and sterilization. They also have a higher rupture rate on long-term follow-up. Continuous 4/0 silk sutures are used for the anastomosis after the subintimal plaques have been trimmed and, if necessary, sutured to the outer coat of the arteries. Failure to do this was the cause of a dissecting aneurysm commencing at the iliac anastomosis in one case of aortic resection performed for a non-ruptured aneurysm. Release of the clamp is followed by hypotension. This can be controlled or prevented by increasing the transfusion rate at this time and by controlling the outflow tract in the leg by upper-thigh tourniquets or by temporary arterial clamps in the iliac or femoral arteries. These are removed individually as the pressure plateaus to a satisfactory level. Vasopressor agents can be a useful adjuvant at this time.

Proximal control of the thoracic aorta (Javid *et alii*, 1955) and hypothermia have both been suggested for the management of infrarenal aneurysms. We believe that neither procedure is necessary and indeed imposes an additional strain on the patient, with an increased risk of anuric complications.

Post-Operative Management.

There are many complications which can arise. Owing to the great dissection by the bleeding and by the surgery of the posterior abdominal wall, a degree of ileus is usual. However, this has been readily managed in orthodox ways. Post-operative ischæmia of the legs from thrombosis or embolism is frequently reported (Farrar *et alii*, 1956; Shumacker and King, 1955). The state of the pulses and the presence of acute ischæmic and leg pain must be closely watched in the first 24 hours after operation, as in some instances it is possible to perform successfully an embolectomy or thrombectomy. Wound healing may be imperfect, owing partly to the age and general condition of the patient, and to some extent to the elimination of the lumbar contribution to the abdominal wall blood supply. Technical failure at the anastomotic line with a delayed hæmorrhage is uncommon and probably usually follows infection at this site. Mavor *et alii* (1959) report colonic necrosis after resection which is attributable to the division of the inferior mesenteric artery, infiltration of the mesentery with blood, hypotension and interference with the internal iliac circulation. Severe pre-operative or operative hypotension may lead, as in Cases II and IV, to immediate or delayed death from cardiac, cerebral or renal causes.

Mortality.

The mortality from this form of emergency surgery must remain high. The patients are old (the average age of patients with aneurysms of the aorta detected at necropsy is 75 years), they often have generalized vascular disease and they have frequently suffered a catastrophic blood loss. Certainly the patients who survive for many hours or days after the rupture must carry a better prognosis than the group who present in severe peripheral collapse associated with the initial pain.

Figures from specialized clinics (Mavor *et alii*, 1959) suggest that about 50% of patients submitted to operation succumb. What the long-term outlook is for the survivors is still not ascertained, and this will probably depend on the localized nature or otherwise of the atheroscleromatous process.

Summary.

1. The clinical presentation of four cases of ruptured abdominal aneurysm is recorded, and attention is drawn to the period of survival, which may last from hours to days after the initial rupture.

2. The technique of surgical management is discussed; it is reemphasized that many of these patients may have quite localized atherosclerosis, and after resection of the aneurysm can lead full and active lives.

3. It is suggested that the aneurysms may fall into two groups: (i) those with an initial profound shock and hypertension, who succumb to cerebral or renal damage even after excision of the aneurysm; (ii) a more favourable group, in which the shock is minimal and the immediate prognosis after surgery is excellent.

Acknowledgements.

We are appreciative of the practitioners and consultants who diagnosed and referred these patients to the vascular service, and to Mr. Noel Bonnin for permission to reproduce Figure II.

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PURULENT MENINGITIS IN CHILDHOOD.

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THE advent of chemotherapy and antibiotics produced an abrupt change in the management of purulent meningitis in childhood. However, despite further broadening of the antibiotic spectrum, meningitis still occurs sufficiently often and still carries a significantly high mortality to be considered a serious problem in childhood.

This study was planned to evaluate the present situation and to discuss the difficulties which still exist in the management of this condition.

The basis of this review consists of all cases of primary purulent meningitis admitted to the Adelaide Children's Hospital during the seven-year period from 1953 to 1959 inclusive. There were, in all, 237 cases in children, which are separated from an ætiological viewpoint in Table I.

Incidence.

Throughout the period of study the annual admission rate has been maintained at approximately 34 cases. Latterly there has been a decreased number of both meningococcal and influenzal cases. This has been countered during the same period by an increased number of cases of neonatal meningitis, mostly due to *Escherichia coli*.

The individual incidence is broadly in accordance with the series reported by Smith (1954), influenzal meningitis being the commonest, meningococcal the next most common and pneumococcal meningitis the least common of the commoner types of meningitis in children.

The incidence of cases of proven purulent meningitis in which the ætiological agent was not identified during the course of the disease (classified as "unknown" cases) was slightly less in the present series than in the series presented by Smith. It was suspected that cases of meningitis had occurred during the first week of life in maternity hospital nurseries and that fatal results had ensued before transfer could be arranged to a pædiatric hospital. The figures may therefore not be truly representative of the actual incidence at this age.

The miscellaneous group contains cases which were predominantly neonatal in distribution, and due to such organisms as *Staphylococcus*, *Proteus*, *Salmonella* and *Streptococcus*, which are rare causes of meningitis in children. Collectively this group and the coliform group constitute the cases of neonatal meningitis and parallel the incidence reported in a much larger series by Watson (1957).

Age Incidence.

Meningitis in childhood is largely a problem of the perinatal period and of infants (Figure I).

Of the total cases, 33·6% occurred in children less than six months of age, 55·6% in children of less than one year and 87% in children under four years. The series reviewed by Turner (1959) showed that more than half

TABLE I.
Annual Incidence of Individual Types of Meningitis.

Type of Meningitis.	Number of Cases.[1]							
	1953	1954	1955	1956	1957	1958	1959	Total.
Influenzal	7 (1)	11 (2)	10 (2)	9 (0)	12 (4)	14 (3)	4 (0)	67 (12)
Meningococcal	11 (2)	10 (1)	6 (1)	11 (1)	10 (0)	8 (0)	5 (0)	61 (5)
Pneumococcal	7 (2)	2 (1)	6 (1)	7 (2)	3 (1)	4 (1)	7 (2)	36 (10)
Coliform	1 (0)	1 (1)	0 (0)	1 (0)	0 (0)	3 (3)	3 (2)	9 (6)
Miscellaneous	0 (0)	1 (1)	3 (1)	1 (1)	0 (0)	0 (0)	2 (2)	7 (5)
"Unknown"	8 (0)	8 (0)	5 (0)	11 (1)	8 (0)	6 (1)	11 (1)	57 (3)
Total	34 (5)	33 (6)	30 (5)	40 (5)	33 (5)	35 (8)	32 (7)	237 (41)

[1] Figures in parentheses represent fatal cases.

of her cases occurred within the first two months of life.

Seasonal Incidence.

The increase in admission rate coincided with the onset of colder weather. Table II shows that from May until December the monthly incidence is considerably increased.

Clinical Picture.

The children are mostly so young that the classical features of meningitis cannot be elicited. Evaluation of the mode of presentation of the patients studied revealed no specific pattern. The features which bring children to the physician are those of any acute infection in childhood.

The tetrad of vomiting, irritability, difficulty in feeding and undue drowsiness has occurred often enough in the children of this series (Table III) for one to state that these four signs strongly indicate the possibility of meningitis, and a lumbar puncture is mandatory. These features, individually common to a diversity of conditions in childhood, when associated are characteristic of meningitis in chiildhood.

Convulsions occurred surprisingly infrequently when it is considered that they represent one of the classical manifestations of meningitis (Nelson, 1959). Kernig's sign and neck stiffness, also classically described in this disease, were found only in 49·5% and 60% of cases respectively. They were most often absent in the younger infants and neonates.

Pneumococcal meningitis caused the temperature to be higher than 102° F. more consistently than other types of meningitis. Patients whose temperature on admission to hospital exceeded 104° F. were found most often to have influenzal meningitis. It is not claimed that this is of diagnostic significance, but it is of interest. Neonatal patients frequently had normal or subnormal temperatures on admission.

A review of these cases revealed in thirteen cases (5·8%) a history of a fall or injury involving the head within the week before the onset of the symptoms. In many of these cases either the parents or the physician attributed the subsequent development of symptoms to this injury. Although this fact frequently brought children to medical attention at an earlier date, it also often caused misdirection of thought from the possibility of meningeal infection to meningeal irritation. Such episodes of trauma, all too common in childhood, are occasionally related to subsequent meningitis, but in this series they more frequently proved the red herring that caused further delay before the correct diagnosis was made.

Diagnosis.

Clinical Features.

Mode of Onset.—The duration of symptoms before the diagnosis was made showed the onset to be acute or fulminating in 51·5% of cases of pneumococcal meningitis, in 44% of cases of meningococcal meningitis, in 42·5% of cases of influenzal meningitis and in 41·5% of cases of unknown ætiology.

Age of Onset.—Hæmophilus influenzæ meningitis has a peak incidence during the second year of life, in contrast to the other types of meningitis which occur most often during the first months of life. The miscellaneous types, especially coliform meningitis, are confined to the neonatal age group. The composite character of the "unknown" group is demonstrated also in Figure I as

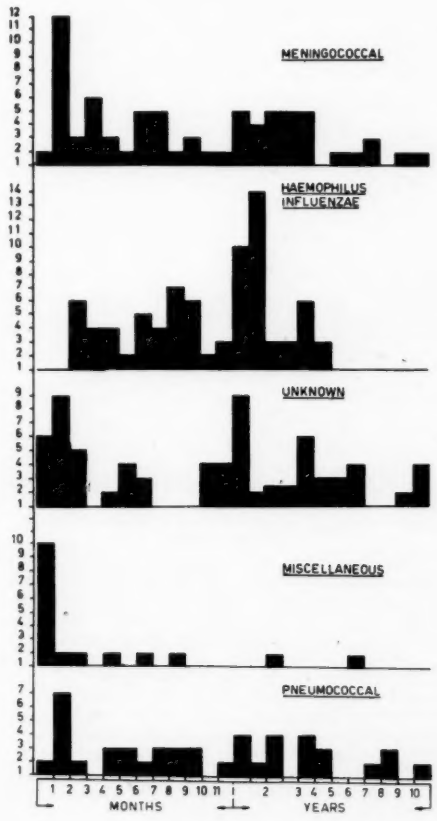

FIGURE I.
Graph showing incidence of various types of meningitis at different ages.

the peaks of incidence correspond to those of the other known types of meningitis. This serves as some guide in determining the likely cause of an individual case of meningitis before a bacterial diagnosis can be established.

Clinical Picture of Individual Types of Meningitis.—Antecedent respiratory or ear infections were commonly found in adults with pneumococcal meningitis (Rischbieth, 1960), but were found in less than 20% of children. In both influenzal and pneumococcal meningitis a preceding respiratory illness was found in a

TABLE II.
Monthly Incidence of Meningitis Cases.

Type of Meningitis.	Number of Cases.												
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Pneumococcal ..	2	1	0	2	4	2	5	5	5	2	3	5	36
Influenzal ..	1	0	4	5	6	5	13	9	7	2	8	7	67
Meningococcal ..	4	0	5	0	2	9	10	4	9	9	4	5	61
Unknown "	7	2	1	1	6	4	6	9	4	7	4	6	57
Coliform ..	0	0	0	0	0	0	1	3	3	2	0	0	9
Miscellaneous	1	1	0	1	2	1	0	0	0	0	0	1	7
Total	15	4	10	9	20	21	35	30	28	22	19	24	237

similar percentage of cases, which precluded the attachment of any ætiological importance to a history of respiratory symptoms prior to the onset of the meningitis. The purpuric exanthem characteristically seen in meningococcal meningitis has been reported to occur with influenzal meningitis, albeit rarely (Warthen, 1948), and one such case occurred in this series. When this is considered with the fact that only 36·1% of cases of meningococcal meningitis studied featured a purpuric rash, it suggests that the presence or absence of purpuric skin lesions neither negates nor confirms a diagnosis of meningococcal meningitis. Convulsions, relatively rare in childhood meningitis as a whole, were much more commonly reported in influenzal meningitis than in any of the other forms. Three of nine cases of meningitis caused by *E. coli* featured the presenting sign of cyanosis; this suggests that meningitis must be considered as a diagnosis to be excluded in any infant developing cyanosis in the neonatal period.

TABLE III.
Symptoms and Signs on Admission to Hospital.

Type of Meningitis.	Percentage of Cases.									
	Vomiting.	Drowsiness.	Irritability.	Ear Infection.	Cough.	Feeding Difficulty.	Headache.	Convulsions.	Pyrexia.	Rash.
Pneumococcal ..	53	39	39	20	20	14	14	11	—	—
Influenzal	51	30	24	—	24	19	—	21	10	—
Meningococcal	46	33	36	—	—	39	10	12	7	36
"Unknown"	55	25	23	—	9	23	16	22	9	9

Laboratory Tests.

Cerebro-Spinal Fluid.—The cerebro-spinal fluid findings on admission to hospital were analysed to assess any possible diagnostic features (see Table IV). The cerebro-spinal fluid leucocyte count was in excess of 10,000 per cubic millimetre in meningococcal meningitis more frequently than in any other type of meningitis. The protein level in the cerebro-spinal fluid was raised to the same degree in all types of meningitis. The sugar level, classically lowered in bacterial meningitis, was appreciably lowered most often in the cases of influenzal meningitis. The presence of a normal or raised cerebro-spinal fluid sugar level on admission to hospital does not preclude a diagnosis of bacterial meningitis. Of interest was the chloride concentration, typically lowered in tuberculous meningitis, which was found in 14 of 61 cases studied to be below 700 mg. per 100 ml.

Blood.—The blood revealed a polymorphonuclear response to infection in almost all cases. The leucocyte response was greater, exceeding 40,000 per cubic millimetre in four cases of pneumococcal meningitis and was consistently higher in this form of meningitis than in any other type.

Differential Diagnosis.

The diagnoses most easily confused with bacterial meningitis in this series were taken from the provisional diagnoses made on admission to hospital of the cases not recognized as meningitis.

Bronchopneumonia was the commonest diagnosis confused with meningitis. A number of children were considered to have otitis media, upper respiratory tract infections and pyrexia of unknown origin. The presence of convulsions and the lack of confirmatory signs caused several cases to be classed as "fits" for investigation. Several children were thought to have gastro-enteritis, and patients with recent episodes of trauma were often admitted with suspicion of subdural effusion or concussion.

The diversity of the modes of presentation serves to indicate the necessity for the development of a high level of suspicion of all children with features consistent with meningitis.

Treatment.

In each case all drugs given for at least 48 hours during the course of the disease were analysed, and this analysis revealed that a wide variety of combinations of drugs had been used. This lack of uniformity of treat-

TABLE IV.
Cerebro-spinal Fluid Findings of Individual Types of Meningitis on Admission to Hospital.[1]

Type of Meningitis.	Number of Cases.											
	White Cell Count (Cells per cubic millimetre).				Protein Level (mg. per 100 ml.)			Sugar Level (mg. per 100 ml.)			Chloride Level (mg. per 100 ml.)	
	>10,000	5000–10,000	1000–5000	<1000	>100	40–100	<40	<20	20–40	>40	>700	<700
Meningococcal	23	15	12	2	40	7	1	9	10	14	16	1
Influenzal	4	10	23	15	34	12	1	16	5	10	13	4
Pneumococcal ..	1	4	15	13	20	4	2	10	3	10	6	3
"Unknown"	7	6	21	18	30	20	1	4	12	18	12	6

[1] Figures are incomplete, as full investigations were not performed in every case.

ment produced considerable difficulty in evaluation of the efficacy of individual therapeutic régimes used. Table V shows the more commonly used antibiotic combinations in the different types of meningitis. The initial antibiotic therapy used while a bacteriological diagnosis was awaited has consisted of all four drugs — penicillin, streptomycin, chloramphenicol and sulphadiazine. In the majority of "unknown" and influenzal meningitis cases, and also in a relatively large number of pneumococcal and meningococcal meningitis cases all four drugs have been maintained throughout the course of the disease as the treatment of choice.

TABLE V.

Treatments Commonly Used in this Series.

Treatment.[1]	Number of Cases.[2]			
	Influenzal.	Meningococcal.	Pneumococcal.	"Unknown."
P., S., ST., C. ..	26 (3)	10 (0)	7 (1)	23 (0)
P., S.	0 (0)	21 (4)	9 (1)	7 (0)
P., S., ST. ..	10 (4)	18 (1)	5 (1)	9 (0)
P., S., C. ..	9 (1)	9 (0)	4 (1)	7 (1)
S., ST., C. ..	11 (1)	0 (0)	0 (0)	0 (0)
P., ST., C. ..	1 (0)	1 (0)	3 (2)	1 (1)
C.	1 (0)	0 (0)	2 (2)	2 (0)
S., C.	3 (0)	1 (0)	0 (0)	0 (0)
P.	1 (1)	0 (0)	1 (1)	0 (0)
S., ST. ..	1 (1)	0 (0)	1 (0)	0 (0)
P., C.	0 (0)	0 (0)	0 (0)	1 (1)

[1] P. = penicillin; ST. = streptomycin; S. = sulphadiazine; C. = chloramphenicol.

[2] Figures in parentheses represent fatal cases.

Influenzal Meningitis.

It was apparent that the cases in whose therapy chloramphenicol was not included had a poorer prognosis than those whose therapy included this drug.

A sulphonamide and chloramphenicol, with or without streptomycin initially, was the most successful combination of drugs in the cases of this series.

In eight cases, in all of which recovery occurred, rabbit serum was used as an adjunct to therapy. Ten children received intrathecal therapy (penicillin, streptomycin or chloramphenicol); all of these children recovered.

Meningococcal Meningitis.

The majority received penicillin and sulphadiazine, with or without the addition of streptomycin. Intrathecal therapy was given to nine children; one of these patients subsequently died.

Pneumococcal Meningitis.

Penicillin with sulphadiazine was the most frequently used combination. Again, many children received all four drugs, and to the remainder either streptomycin or "Chloromycetin" was added to the régime of penicillin and sulphadiazine. In this condition those régimes including chloramphenicol had higher mortality rates. Two patient who died received this drug alone. Fifteen patients received intrathecal therapy and three of these children died.

"Unknown" Meningitis.

In this group, in which specific therapy could not be used as the ætiological agent was never determined, all four drugs were commonly used. This group had such an inherently good prognosis that little information could be drawn from a consideration of the treatment given. Two of this group received intrathecal therapy.

Neonatal Meningitis.

Patients in this group were often suffering from an overwhelming infection which was frequently rapidly fatal before the effect of therapy could be assessed. The drugs most commonly used were chloramphenicol and streptomycin.

Complications.

The incidence of complications varied greatly in individual groups, and was much higher in cases of pneumococcal meningitis than in any other group. In the "unknown" group only one patient showed any complication during the course of the disease. The complications were considered to be either neurological or general.

Subdural effusion was the commonest neurological complication, evidenced by focal convulsions or neurological signs, papillœdema, vomiting and drowsiness during the course of the disease. Cranial nerve palsies affected predominantly the ocular muscles and produced strabismus.

TABLE VI.

Complications of Meningitis in Present Series.

Complication.	Number of Cases.			
	Pneumococcal.	Meningococcal.	Influenzal.	"Unknown."
Neurological:				
Subdural effusion ..	4	7	4	0
Cranial nerve palsies	2	0	2	0
Convulsions ..	0	0	1	0
Arachnoiditis ..	0	1	0	0
Clinical relapse ..	3	0	0	0
Waterhouse - Friedrichsen syndrome	0	1	0	0
Total	9 (25·0%)	9 (14·8%)	7 (10·4%)	0
General:				
Pericarditis	0	1	0	1
Paralytic ileus ..	1	0	1	0
Pneumonia ..	1	0	0	0
Congestive cardiac failure	2	0	0	0
Nephritis	1	0	0	0
Monilial abscess ..	0	1	0	0
Total	5 (13·9%)	2 (3·3%)	1 (1·5%)	1 (1·8%)
Grand total ..	14 (38·9%)	11 (18·1%)	8 (11·9%)	1 (1·8%)

Convulsions severe enough to warrant heavy sedation developed in one case of influenzal meningitis, and clinical relapse after initial improvement occurred in three cases of pneumococcal meningitis.

General complications resultant from the accompanying septicæmia and profound toxæmia were also more frequent in pneumococcal infection.

In the case of *E. coli* meningitis the three patients who survived all had complications; one patient developed a subdural effusion, another ultimately became hydrocephalic and the third suffered two recurrences before complete cure was effected by the excision of a sinus in the lumbo-sacral region (reported by Simpson and Cockburn, 1956).

Sequelæ.

Residual effects consequent upon the meningitis were again commonest after pneumococcal infection. Meningococcal meningitis had the lowest incidence of sequelæ. Paraplegia and hemiplegia were seen in several cases. The deafness seen in three cases followed the exhibition of streptomycin in all three children, although only for a brief course of less than a week. It has been reported by Alexander (1952) that even this duration of therapy can be productive of deafness.

One child with quadriplegia following influenzal meningitis was discharged from hospital still with an abnormal cerebro-spinal fluid; the child had repeated convulsions at home and subsequently died.

Mortality.

Of the 237 children in this series 41 died — an over-all mortality of 17·3%. The annual death rate has not decreased throughout the period of study; during the last two years the figure rose to greater than 20%. In these years six cases of *E. coli* meningitis occurred, and

five of these patients died. Even disallowing these cases, the corrected figures are 15·5% and 11·1% for 1958 and 1959, and there has thus not been any real change in the prognosis during the seven-year period under study.

The most serious forms of meningitis are those affecting the new-born infant. Fortunately these are relatively rare, but carry a grave risk to the child.

Pneumococcal meningitis is the most serious of the commoner types of meningitis, and the mortality rate of 27·8% in this hospital is far higher than that for either influenzal meningitis (17·9%) or meningococcal meningitis (8·2%). The "unknown" group had a mortality rate (5·4%) far lower than did the group which could be diagnosed bacteriologically, and received more specific therapy.

TABLE VII.
Sequelæ of Meningitis in Present Series.

Sequela.	Number of Cases.			
	Pneumococcal.	Meningococcal.	Influenzal.	"Unknown."
Hydrocephalus ..	3	1	1	1
Paraplegia	0	0	1	1
Deafness	1	0	1	1
Behaviour problem ..	1	0	0	2
Epilepsy	1	1	0	0
Strabismus	1	0	0	0
Speech defect ..	0	1	0	0
Hemiplegia	0	0	2	0
Total ..	7 (19·4%)	3 (4·9%)	5 (7·5%)	5 (8·8%)

Meningococcal meningitis, in which a fatal result has not occurred during the last three years, is the only form of meningitis in which the prognosis has altered appreciably during the period of study.

The seriousness of meningitis in the younger child is demonstrated by the fact that 31 deaths (75·6%) occurred in children less than one year old, whereas children in this age group represented only 55·6% of the total cases of meningitis.

In influenzal meningitis the mortality rate for children younger than one year was 24·2% and for older children 8·8%. In pneumococcal meningitis the corresponding figures were 35% and 18·7%. However, meningococcal meningitis mortality rates showed no age difference, the figures being 8·3% and 8·0%.

Discussion.

This series of cases demonstrated neither a decreased incidence nor a decreased mortality rate throughout the past seven years at this hospital. These figures were maintained despite the advances made in chemotherapy for the treatment of bacterial infections during this period. In all types of meningitis except meningococcal both the incidence and the mortality rates have remained constant or have increased. In meningococcal meningitis there has been a fall in the mortality rate in the last three years.

The clinical picture has reproduced the signs of childhood meningitis reported in former series (Smith, 1956), which consist of non-specific features — vomiting, feeding difficulties, drowsiness and irritability. It is this non-specificity of presentation, together with the infrequency with which the classical signs of meningitis, neck rigidity and Kernig's sign can be demonstrated, that have contributed to the diagnostic delay and the subsequent incomplete recovery and high fatality rate in children.

The use of lumbar puncture for any child who is admitted to hospital, or who is seen at home, with this tetrad of signs and symptoms will improve the figures in this childhood disease.

Parents will frequently attribute these symptoms to any recently remembered episode of trauma to the head (so common in children of this age group); this is a red herring that has caused delay in diagnosis in a number of these cases. An awareness of this association should be of value in considering the ætiology of undue drowsiness or irritability in such a child.

The seasonal incidence of meningitis, in which an increased incidence is seen in the winter and colder period of the year, is again shown in this series. In summer (the first three months of the year), purulent meningitis becomes an extraordinarily rare condition.

The presence of a purpuric rash on admission to hospital is almost diagnostic of meningococcal meningitis. This type of rash has been reported rarely in other forms of meningitis in association with the Waterhouse-Friedrichsen syndrome. In this series one case of influenzal meningitis had a rash of this type, although the case notes do not permit the complete nature of this eruption to be elicited; however, this may be a further case demonstrating this association. The rarity of this rash is of theoretical rather than practical importance, but it does not permit a diagnosis to be made unequivocally of meningococcal infection if the child exhibits a purpuric rash on admission.

Convulsions, classically a sign of meningitis, are also seen relatively infrequently in childhood meningitis and the absence of this sign should not negate a diagnosis of meningitis, or direct the diagnostic search from the nervous system.

Prodromal respiratory symptoms assume importance in diagnosis, by their suggestion that the infection is likely to be influenzal or pneumococcal, for they are rarely seen in meningococcal meningitis.

This paper reiterates the findings of Smith (1956), that childhood meningitis differs from adult infection not only in its prognosis but in its mode of presentation and in its clinical picture.

The transfer of parental antibodies and the later development of acquired immunity during childhood against the individual ætiological organisms is stated by Fothergill and Wright (1933) and Sutliff and Finland (1932) to be the explanation for the different age incidence of various types of meningitis. This has been demonstrated in the series under review (Figure I), in which in *H. influenzæ* meningitis, cases have not been encountered beyond well-defined age limits in childhood, corresponding broadly with the ranges given by Fothergill and Wright, and Sutliff and Finland.

A number of patients had received chemotherapy before their admission to hospital, or before a bacteriological diagnosis had been made. The effect of this therapy upon the ultimate prognosis and its relation to the production of "unknown" cases was reviewed.

Eighty-three of 221 patients received antibiotic treatment for periods greater than two days before admission to hospital; of these patients 11 died — a mortality rate of 13·2%. Of the remaining 132 patients who did not receive chemotherapy prior to admission, 18 children died — a mortality rate of 13·0%.

In individual types of meningitis, pneumococcal meningitis had its mortality rate reduced by half if chemotherapy was given before admission. In influenzal meningitis the reverse occurred, the death rate being higher in those who received therapy before admission.

Children with meningitis classified as unknown received pre-hospital chemotherapy in 49·1% of cases, while 33·5% of patients in whom the causative organism was subsequently isolated received such therapy; this suggests that the use of chemotherapy before diagnosis was confirmed was one factor concerned in the production of "unknown" cases.

The use of antibiotics before diagnosis had been made was considered to be of doubtful value in the ultimate prognosis. The improved results in pneumococcal meningitis cases were balanced by the effect on the prognosis in influenzal cases.

An initial lumbar puncture and collection of fluid for identification of the ætiological organism is desirable in all cases of suspected purulent meningitis before the commencement of therapy.

Regrettably, the treatment in this series has not been standardized, and a true evaluation of this aspect of the problem has not been possible.

Specifically suitable drugs have been used in variable combinations with less suitable drugs, and their individual value is difficult to assess.

Multiple antibiotic therapy as used in the majority of "unknown" cases has been condemned by some writers (Jawetz *et alii*, 1950), because of the possible antagonism bewteen the antibiotics used (Smith, 1956), and because of the danger of drug sensitivities, expense and possible omission of the specific drug required. The use of sulphonamides and chloramphenicol or other broad-spectrum antibiotic is considered sufficient by Moll and Warmington (1954), and the addition of penicillin is permitted by others (Platou *et alii*, 1959). It is in the group of "unknown" cases that the value of this multiple-agent therapy appeared superficially to be of benefit, as these patients, who all experienced such a régime, had a much lower mortality rate than did the other groups of meningitis patients. This improved survival rate could be taken to represent the efficacy of this form of treatment.

A close analysis of this group revealed points of some interest and an explanation of this anomaly. The mode of onset and the initial pathological findings in the cerebro-spinal fluid were compared to those of the other types. The onset was consistently less acute or fulminating. As this group contained representatives of all of the other types of meningitis, it indicated that these "unknown" cases were more benign in their character. The only fundamental point of distinction between these cases and those included in the diagnosed groups is that in these the cerebro-spinal fluid had become sterile, either after therapy received before admission to hospital, or because the bacterial invasion of the cerebro-spinal fluid was numerically less severe, and a culture of these organisms could not be made.

In the cerebro-spinal fluid the cell count, the elevation of the protein level and the depression of the sugar level were abnormally altered less frequently in this type of meningitis. This "unknown" group therefore does not represent a better response to better therapy, but rather a form of meningitis which has an inherently better prognosis. An additional point demonstrated was that multiple antibiotic therapy was used in the known types of cases without producing the overwhelmingly successful results seen in the unknown group.

By comparison with other series (Smith, 1956) this mortality rate is high, and the difference occurred in the influenzal and pneumococcal groups. The reasons for these disappointing figures lies in the delay before diagnosis was made in these types, and in the less specific therapy used. Study of the provisional diagnoses made on admission to hospital in all groups has shown that, although the majority were correctly diagnosed initially, the seriousness of the situation was not realized in many and the presence of meningitis was not considered for periods of up to 24 hours after admission to hospital. This delay in diagnosis and commencement of treatment has played a part in the ultimate outcome in these cases.

The incidence of complications and sequelæ is high in all groups, and they are predominantly cerebral in nature. Subdural effusions and their associated residual neurological defect are commonest. These figures suggest that multiple drug therapy either disallows full action of the specific drugs used or causes some specific effect by its very nature which induces complications and sequelæ. The frequent addition of a drug in the hope that one additional agent will be of some added benefit to the child appears rather to add the risk of incomplete or delayed resolution of the process and to the increased likelihood of a complicated course for the case of meningitis.

Neonatal meningitis presents problems of even greater moment than those already considered (Watson, 1957; Turner, 1959). Here the infection is frequently acquired by the flora of the maternal birth canal passing to the child's skin, eyes, umbilicus and mouth. The infections are overwhelming in most cases and frequently have proved rapidly fatal. The non-specificity of onset is again demonstrated in this group, as cyanosis and vomiting were the commonest modes of presentation; the rapid progression to death has resulted in several of these cases not being diagnosed until autopsy. This fact indicated the likelihood that many of these children die in maternity nurseries and a diagnosis is not made unless autopsy is performed. Improvement in the figures for this group will be attained only by an increased awareness of the likelihood of this condition in the neonatal period.

Coliform meningitis is the commonest type of neonatal meningitis encountered and chloramphenicol the best single drug in this group (Woodward *et alii*, 1953).

One case of *E. coli* meningitis proved of exceptional interest and has been reported by Simpson and Cockburn (1956); in this the child suffered two recurrences, and not until a sinus tract, which proved to be a nidus of infection, was excised in the lumbar region, did the child ultimately improve and recover completely.

The prognosis of childhood meningitis is therefore still poor, particularly in pneumococcal and influenzal meningitis and in neonatal infection.

Summary.

Two hundred and thirty-seven cases of purulent meningitis were treated in the Adelaide Children's Hospital over a seven-year period and have been reviewed. Forty-one patients died (17·3%) and there is no indication of an appreciable improvement in mortality rates during this period.

The age incidence has been discussed in relation to the transfer of maternal antibodies, and the seasonal incidence has been recorded.

It is advocated that treatment should be limited to those drugs which act specifically against the type of meningitis under consideration. It is further suggested that varied combinations of multiple antibiotics have contributed to the poor results obtained in the past, both in regard to the mortality and to the incidence of complications and sequelæ.

The "unknown" group of cases has been discussed, and the nature of the meningitis, in relation to therapy and prognosis, interpreted as representing a less severe form than the diagnosed types of meningitis.

Neonatal meningitis has been considered to present the problems of delayed diagnosis and of overwhelming infection at this age. Chloramphenicol is suggested to be the best single agent in meningitis in the neonatal age group.

The non-specific character of the clinical picture is reiterated and the significance of rashes, respiratory symptoms and cyanosis discussed.

The contention is put forward that the fundamental problem in childhood meningitis is delayed diagnosis, arising from unawareness of the possibility of this condition being present. Childhood meningitis still presents a serious problem to those who treat children.

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CLINICAL STUDIES ON THE DIURETIC PROPERTIES OF "SALCO".

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PREVIOUS reports on the drug "Salco" (4 chlorobenzene–1, 3–disulphonamide) in Europe suggested that it might prove to be a valuable oral diuretic agent (Düster, 1959; Kabisch, 1959; Jacob, 1960; Wolff, 1960). Though potent oral diuretic agents are already available, it is worthwhile establishing the clinical value of new unrelated drugs in order to allow a wide choice in cases of idiosyncrasy or other contraindications. The results of a clinical trial designed to assess the diuretic properties of "Salco" are recorded below.

Chemistry.

The active ingredient of "Salco" is 4 chlorobenzene–1, 3–disulphonamide. The formula is shown in Figure I. It forms white crystals which melt at 217°–219° C., and is soluble in acetone and ethyl alcohol. Its solubility in urine depends upon the pH. In distilled water at 37° C. the solubility is 0·75% (the solubility of chlorothiazide in distilled water at 37° C. is 0·057%). In acid urine, "Salco" and chlorothiazide are both relatively insoluble, whereas an alkaline urine both are more soluble than in distilled water.

Clinical Material and Method of Study.

Effect of "Salco" on the Excretion of Water and Electrolytes.

The effect of "Salco" on the urinary excretion of water and electrolytes was studied in 20 patients. Twelve had heart disease and eight of these were œdematous. The remaining eight patients had a variety of non-cardiac medical complaints; two had œdema associated with the nephrotic syndrome.

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The twenty-four-hour volume of urine and its sodium, chloride and potassium contents were measured daily. Measurements were made on two control days preceding the first administration of "Salco". Doses of 400 mg. of "Salco" were compared with 500 mg. and 1000 mg. of chlorothiazide. Diuretics were never used on two consecutive days. In three cases, sodium and volumes were measured on timed two-hourly collections of urine. In two healthy subjects the pH of timed urine specimens was determined. The fluid intake was unrestricted. The diet remained unchanged for each patient during the period of investigation. Some patients received a diet of low sodium content throughout the period of study.

Therapeutic Effect in Œdematous Patients.

It is difficult to obtain objective evidence of the therapeutic efficacy of a diuretic agent in removing œdema. An œdematous patient may have a diuresis and improve clinically with bed rest, whether diuretics are

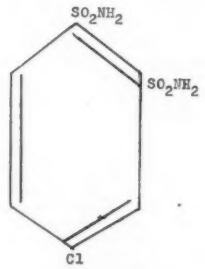

FIGURE I.
Formula for "Salco".

used or not. It may therefore be difficult to assess a diuretic agent solely by observing the effect on clinical œdema and weight. Observations were made on 16 patients (including the 10 œdematous patients mentioned above), in all of whom previous bed rest and/or other diuretic treatment had been employed. Two patients had the nephrotic syndrome and the remainder cardiac œdema.

Toxic Effects.

In order to see whether any toxic effect occurred after the use of "Salco", a series of hæmatological and biochemical tests were performed before and after administration of the drug.

Results.

The Effect of "Salco" on the Excretion of Water and Electrolytes.

Figure II shows the type of procedure carried out in most cases. In each case, a single dose of 400 mg. of "Salco" was administered orally on each of three or more days, and a single dose of 500 mg. or 1000 mg. of chlorothiazide was administered on one day for comparison. On intervening days no diuretic was administered, but urine output and electrolyte excretion were estimated.

Figure II shows substantial increases in urine volume and sodium output on each day on which "Salco" or chlorothiazide was administered. The patient whose graph is illustrated in Figure II had had a myocardial infarction ten days before, but was not œdematous or in congestive failure. In several non-œdematous patients the diuretic effect was greater on the first two days than on the final two days on which the diuretics were administered. For this reason it is held that chlorothiazide was unfavourably compared with "Salco", because it was used after two previous doses of "Salco". From those cases in which (as in Figure II) a good diuresis was obtained with all four doses of diuretics, it would seem that a dose of 400 mg. of "Salco" is as potent as or more potent than 1000 mg. of chlorothiazide as a natriuretic and diuretic agent.

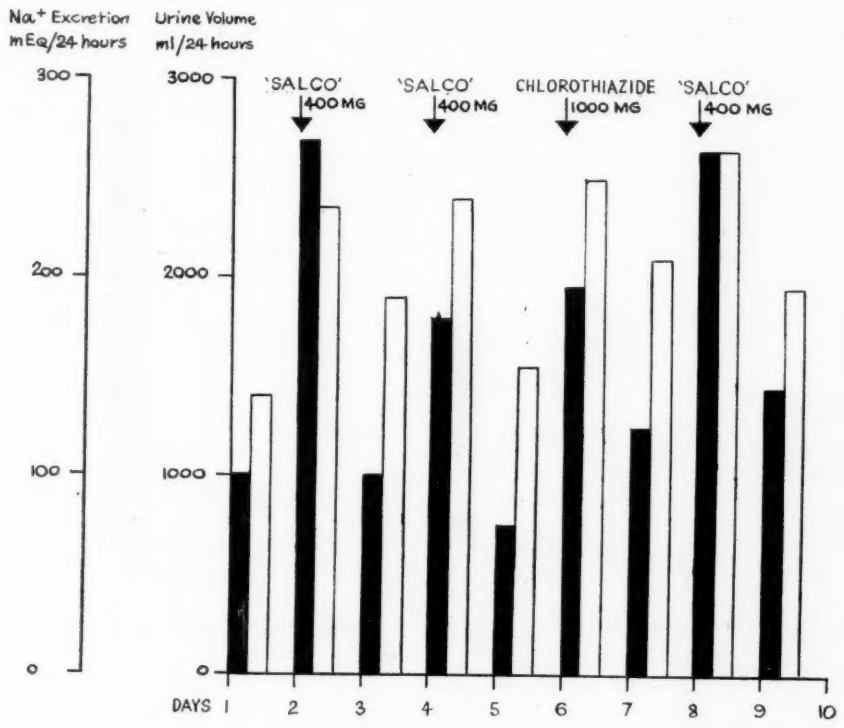

FIGURE II.

Diuretic effect of "Salco" and chlorothiazide in a typical case (solid columns, Na^+ excretion; open columns, urine volume).

TABLE I.

The Average Twenty-four Hour Urine Volume and Urinary Electrolyte Excretion of 17 Patients. A Total of 84 Control Days, 69 Days after 400 Mg. of "Salco" and 20 Days after 1000 Mg. of Chlorothiazide.

Patient.	Control.				"Salco."				Chlorothiazide.			
	mEq/24 Hours.			Ml./24 Hours.	mEq/24 Hours.			Ml./24 Hours.	mEq/24 Hours.			Ml./24 Hours.
	Na^+.	K^+.	Cl^-.	Urine.	Na^+.	K^+.	Cl^-.	Urine.	Na^+.	K^+.	Cl^-.	Urine.
1	96	62	111	1392	183	84	195	1705	—	—	—	—
2	125	70	146	1284	263	99	243	2210	112	74	123	1520
3	68	88	112	1950	123	116	197	2590	56	101	127	2400
4	7	33	28	644	18	40	39	735	11	39	35	820
5	33	22	62	870	138	45	133	1092	80	56	94	1040
6	143	65	156	1460	289	106	281	1863	185	75	192	1520
7	104	92	147	1760	239	151	255	2440	198	136	250	2480
8	52	64	102	1491	65	74	114	1607	40	46	77	1320
9	67	72	90	1680	191	61	169	1855	—	—	—	—
10	92	85	107	1620	159	92	160	1826	—	—	—	—
11	70	74	103	2105	172	112	144	2635	119	136	279	2420
12	<1	35	72	860	191	70	187	2800	78	48	123	1520
13	147	52	162	1000	182	60	162	1180	—	—	—	—
14	177	49	140	1200	208	59	182	1540	—	—	—	—
15	93	—	—	915	156	—	—	1750	105	—	—	1510
16	—	—	—	—	296	101	218	1684	222	61	230	1520
17	—	—	—	—	288	122	241	1510	192	89	197	1110

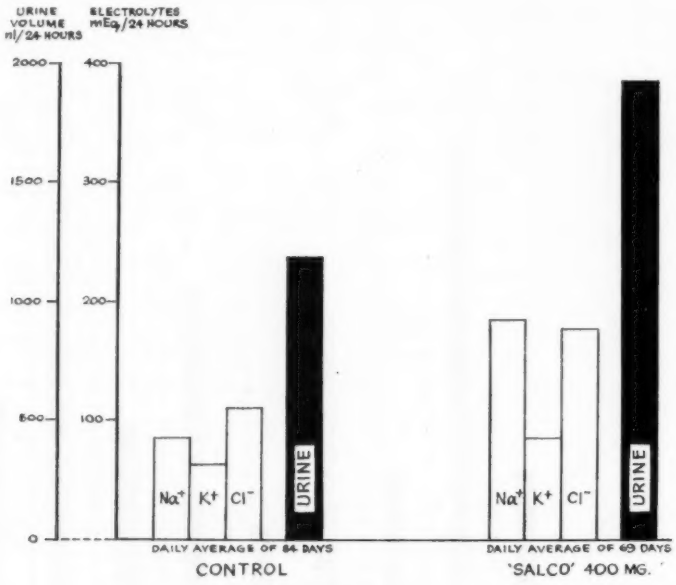

FIGURE III.
Twenty-four-hour excretion of urine and electrolytes; average of 17 patients.

Table I gives the averages of twenty-four-hour urine volumes and electrolyte excretion of 17 patients, in most of whom the procedure illustrated in Figure II was carried out. The table includes estimations on 69 days on which 400 mg. of "Salco" were administered, and 84 days on which no diuretic was administered. Figures for chlorothiazide (20 days) compare very unfavourably with "Salco", but for reasons stated above the comparison is not considered valid.

Figure III shows the averages of the total figures of electrolyte and water excretion for the 17 patients included in Table I. The average figures on 82 control days are compared with those on 69 days on which "Salco" was administered. It is seen that there is an increase in the urine volume and electrolyte excretion after "Salco", the most striking being in sodum excretion, which is 124% above the control figure, while potassium excretion is increased only 40%.

Figure IV shows the average urine volumes and sodium excretion after single doses of 400 mg. of "Salco" and 1000 mg. of chlorothiazide in two healthy subjects. Accurate two-hourly collections of urine were made for the 12 hours following administration of the drugs. The measurements were not made on consecutive days, and no other diuretic was administered at any time. A comparison shows that 400 mg. of "Salco" produced a greater excretion of both sodium and water than 1000 mg. of chlorothiazide.

Comparison of total figures for the twelve-hour period (Figure V) shows a urine volume of 1600 ml. in the 12 hours following the administration of 400 mg. of "Salco", compared with 1365 ml. in the 12 hours after 1000 mg. of chlorothiazide had been given. The sodium and potassium excretions were 292 mEq and 112 mEq respectively after "Salco" and 207 mEq and 75 mEq respectively after chlorothiazide.

In four healthy subjects, the pH changes were estimated by an indicator paper technique in timed urine samples after 400 mg. of "Salco" had been given. The pH was measured in fresh specimens and showed a similar pattern. Within one hour of oral administration, the pH of the urine had risen from below 6·0 to 8·0, and the urine remained alkaline for the next 10 hours, the maximum alkalinity (pH 9·0) being present between two and six hours.

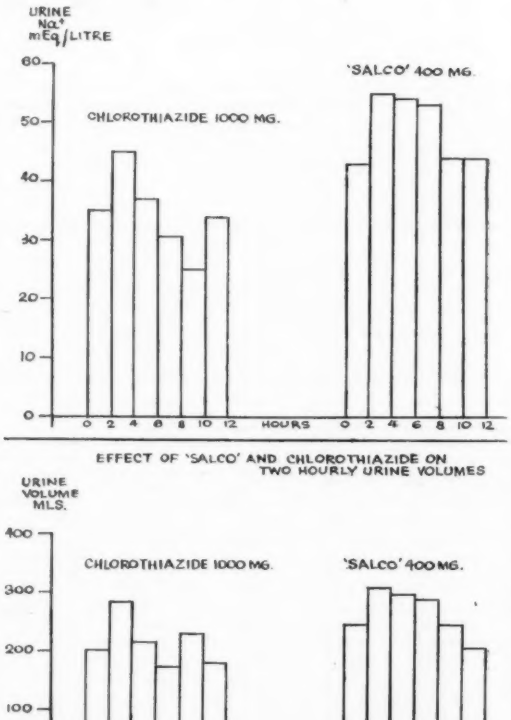

FIGURE IV.
Top: Effect of "Salco" and chlorothiazide on two-hourly Na+ excretion. Bottom: Effect of "Salco" and chlorothiazide on two-hourly urine volumes.

Therapeutic Effect in Œdematous Patients.

It is more difficult in a small number of cases to establish the effect of a diuretic drug in removing clinical œdema than it is to establish its ability to promote diuresis and natriuresis. However, as the former function is dependent upon the latter, the two sections of this study are complementary.

Observations were made on 16 œdematous patients to whom "Salco" was administered for periods of one to 20 weeks. In one patient with severe rheumatic valvular heart disease, the œdema was refractory to "Salco" treatment, as it was to mercurial diuretics and to chlorothiazide. This patient lost 2 lb. in weight during one week while receiving "Salco" therapy on alternate days,

Toxic Effects.

No toxic effects or side reactions to "Salco" were noted in the patients studied. One patient noted a striking increase in appetite while on the drug, but as this was accompanied by amelioration of congestive failure, it may not be significant.

Several blood and urine investigations were carried out before and after administration of the drug. These were a full blood examination, estimation of the erythrocyte sedimentation rate, liver function tests (including electrophoresis of the serum proteins), estimation of the serum electrolytes, blood urea content and urinary protein excretion, and microscopic examination of the urine. In most cases only three doses of 400 mg. of "Salco" were

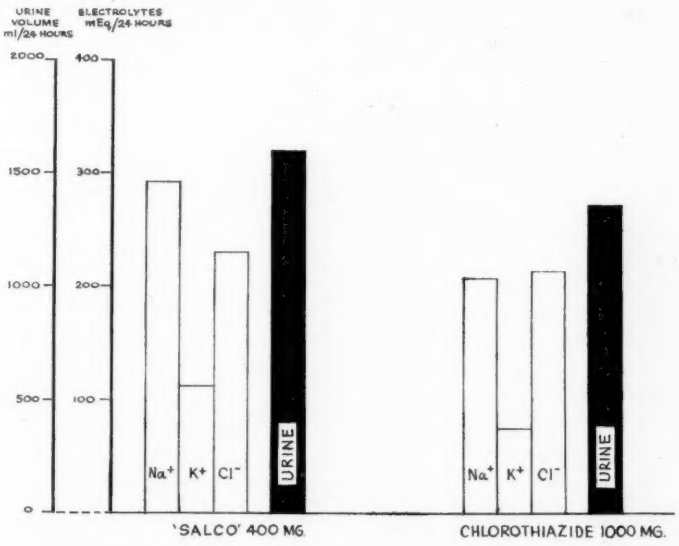

FIGURE V.

Average twelve-hour excretion of urine and electrolytes following the administration of 400 mg. of "Salco" and 1000 mg. of chlorothiazide.

and excreted 37 mEq of sodium on the first day of treatment. However, thereafter the sodium excretion fell to its previous very low values (between 0 and 10 mEq), and this patient had clearly reached the refractory phase in which diuretic therapy is ineffective.

All the remaining 15 patients showed a good clinical response to "Salco" therapy. Weight loss over the first two weeks ranged between 6 and 20 lb. In some cases a very rapid and striking diuresis was achieved, even when bed rest and other diuretics had been used prior to the exhibition of "Salco". Figure VI[1] shows striking resolution of pulmonary œdema and decrease in heart size as a result of a few days' treatment with "Salco". A dose of 400 mg. of "Salco" was given twice daily in this patient with long standing hypertensive and ischæmic heart disease, who had developed pulmonary œdema while taking 500 mg. of chlorothiazide daily.

In one patient with congestive failure, urine volumes were measured for the 24 hours after an injection of 2 ml. of mersalyl and for the 24 hours after an oral dose of 400 mg. of "Salco" over a period of 16 weeks. Mersalyl was given every Tuesday and "Salco" every Friday. The patient became œdematous in the intervening two to three days when no diuretic was given. The average urine volume in the 24 hours after mersalyl had been given was 2710 ml., and in 24 hours after "Salco" had been given it was 3170 ml. On only two occasions in the 16 weeks did mersalyl produce a better diuresis than "Salco". Thus in this case the latter was the more effective diuretic.

[1] For Figure VI see art-paper supplement.

administered, and the investigations were made before and after these doses. In five cases "Salco" therapy has been continued for several weeks, and in two patients six months' continuous treatment has produced no untoward effects. Potassium supplements were employed in the case of only one patient, who had developed hypokalæmia on previous long-term chlorothiazide treatment. Other patients have not shown a significant fall in the serum potassium level. During the period of study no significant changes were detected by the above-mentioned investigations in the 14 cases in which they were performed.

Discussion.

From these clinical studies, it appears that "Salco" is a potent oral diuretic agent, capable of producing diuresis and natriuresis in both œdematous and non-œdematous subjects. It compares favourably with chlorothiazide, doses of 400 mg. of "Salco" being approximately equivalent to 1000 mg. of chlorothiazide. The maximum diuresis follows between two and six hours after a single dose of 400 mg., but some diuretic and natriuretic effects are still noted after ten hours, and in œdematous patients there is a suggestion of an even longer diuretic effect.

Although the drug is a sulphonamide, it is very unlikely that the problem of crystalluria would ever arise. The dose used (400 mg.) is only a fraction of the amount of sulphonamide which may cause crystalluria (4 to 6 grammes per day), and furthermore, "Salco" produces

alkaline urine for a period of 10 hours after its administration, and it is very soluble in alkaline urine.

No toxic effects were noted, nor was any adverse effect found on several hæmatological and biochemical investigations. Some toxic effects have been recorded. Kabisch (1959) found that, when this drug was given continuously, some nausea and diarrhœa occurred in isolated cases, but ceased when the drug was omitted. He found no allergic or other reactions in 80 patients under treatment. One case of urticaria was reported by Düster (1959) in a series of 30 cases.

Summary.

1. The diuretic and natriuretic properties of a new drug, "Salco", have been studied in 26 cases.

2. "Salco" promotes an increase in sodium and water excretion in both œdematous and non-œdematous subjects. The present findings indicate that, when administered by the oral route, a dose of 400 mg. of "Salco" produces diuresis and natriuresis approximately equivalent to that produced by 1000 mg. of chlorothiazide.

3. "Salco" produced a good clinical response in œdematous patients, including some in whose treatment other diuretics had been continuously employed prior to the administration of "Salco".

4. No toxic effects were noted.

Acknowledgements.

We are indebted to Nicholas Pty. Ltd. for the supplies of "Salco" used in this trial, and to Miss B. Splatt of the Royal Melbourne Hospital, Miss M. Bick of the Alfred Hospital and Miss S. Costerman of Dr. J. S. Menzies' Pathological Department for carrying out the biochemical tests.

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THE EFFECT OF CHLORTETRACYCLINE ON AUSTRALIAN PARROTS NATURALLY INFECTED WITH PSITTACOSIS.

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THE psittacosis virus (*Bedsonia*, Meyer, 1953) has been shown to infect many species of Australian parrots (Miles, 1959). Epizootics have occurred in wild birds (Burnet, 1939), and have been of particular importance in the spread of this infection by exported cage birds (Meyer and Eddie, 1934). Human infection in Australia, recorded since 1929 (Merrillees, 1934; Love, 1934), was reviewed by French *et alii* (1954). The number of cases diagnosed has increased recently (Tonge, 1959), and there is serological evidence that as many as 20% of the urban population of Adelaide might have antibodies (Dane, 1955). The recent demonstration (Meyer *et alii*, 1958) that birds could be freed of infection by treatment with chlortetracycline has obvious public health implications for Australia. A series of experiments at the Queensland Institute of Medical Research was therefore carried out to test whether infected Australian parrots could be treated effectively and practically with antibiotics.

EXPERIMENTS IN QUEENSLAND.

Materials and Methods.

White cockatoos (*Kakatoë galerita*) and cockatiels (*Leptolophus hollandicus*), most of them recently caught at various centres in Queensland or New South Wales, were purchased from a commercial dealer, held in a galvanized-iron shed in cages each containing two birds, and identified by leg bands or wing paint.

Birds were received from the dealer and bled from the wing vein, and their sera were tested individually for antibodies. Negative reactors were returned to the dealer, or, in later groups, held to acquire cage infection. The treatment experiments were begun when enough seropositive birds had been collected.

Attendants and laboratory staff wore gowns, caps and masks whenever they entered the shed. No cases of psittacosis occurred among the staff, and complement-fixing antibodies could not be detected in their sera collected at the end of the experiments.

Hulled sunflower seed impregnated with chlortetracycline (10 mg. per gramme) was forwarded to Brisbane by sea from San Francisco. The method of preparation of medicated seed will not be detailed, for the sake of brevity, but a description will be supplied on request to the authors. Crude chlortetracycline (S.F. mix 17) and tetracycline in sesame oil (200 mg. per millilitre with 1% "Ethocel") were generously supplied by the Lederle Laboratories Division, American Cyanamid Company, Pearl River, New York, through the help of Robert L. Burckhardt, V.M.D.

Treatment was given by either of two methods: (i) oral administration. The birds were fed chlortetracycline-treated seed on two of the three feeding days each week, and, on the third day, a chicken mash-rice mixture to which chlortetracycline was added. Antibiotic feeding was continued for 20 days. (ii) Intramuscular injections of 100 mg. (0·5 ml.) of chlortetracycline in sesame oil were given into opposite pectoral muscles on two occasions three days apart.

Similar groups of sero-positive birds were kept as controls in each experiment.

The birds were then held for a further period before being sacrificed. In the 1958 experiments, treated and control birds were separated from each other, and from other birds, during this period. In the 1959 experiments, no effort was made to segregate the groups.

Complement-fixation tests were performed according to the technique of the Viral and Rickettsial Disease Laboratories, California State Department of Public Health (Jensen, 1956), with certain modifications. Thus, sera were inactivated at 56° C. for 30 minutes, and the antigen-serum-complement mixtures were incubated at 37° C. for one hour before the hæmolytic system was added. Antigen was prepared at the Hooper Foundation from infected yolk sac by the method described by Meyer and Eddie (1956).

Agglutination tests were performed in capillary tubes, with serial dilutions of uninactivated serum. The antigen was a preparation of elementary bodies of a New Jersey turkey ornithosis strain, formalinized and stained with Giemsa solution. It was provided by the Hooper Foundation, where it had been prepared in the manner described by Mason (1959).

Chlortetracycline assay of bird blood was carried out by the method described by Grove and Randall (1955), using *Bacillus cereus* spores, with the modification that filterpaper discs were used instead of metal cylinders.

Birds to be harvested were killed with coal gas, plucked and dissected; fresh, sterile instruments were used for each step. Air-sac smears were stained with Giemsa. Blood was obtained by heart puncture. Liver-spleen emulsions in saline were inoculated intraperitoneally into weaned mice. At least three blind passages of mouse liver-spleen were

performed at weekly intervals before the material was discarded as negative in reaction. Psittacosis in mice was suggested by peritoneal fluid and exudate on the spleen or the liver, and was confirmed by the demonstration of typical inclusions in peritoneal smears. In the first group of experiments, negatively reacting material was retested by yolk-sac inoculation, but since virus could not be isolated after two passages, mouse passage was used routinely.

Results.

Infection Rates in Wild-Caught Birds.

In all, 181 cockatoos and 89 cockatiels were tested for evidence of infection. Sixteen of 131 cockatoos tested within two weeks of receipt had antibodies. Among these were eight birds that had been in the dealer's aviary for several months, of which seven had antibodies. The infection rate in other birds was therefore nine in 123. Full details of their origin were not available, but the dealer stated that they were received within a few days of capture in either western New South Wales, or the Darling Downs area of Queensland. The infection rate in cockatiels was higher, three batches giving positive reactions in five cases out of 30, two cases out of 29 and 21 cases out of 30. The third batch had been caught near Theodore, in the Dawson Valley, but had been held for some weeks before we received them. The high rate in that group may, therefore, be the result of cross-infections after capture.

TABLE I.
Isolation of Psittacosis Virus from Treated and Control Birds.

Experiment Number.	Species of Birds.	Route of Treatment.	Period of Holding After Treatment. (Days.)	Isolation Rate.	
				Treated Birds.	Control Birds.
1958 I	*K. galerita.*	Oral.	28	0/8	1/7
1958 II	*L. hollandicus.*	Oral.	28	0/2	1/4
1958 IIIa	*K. galerita.*	Oral.	7	0/3	3/3
1958 IIIb	*L. hollandicus.*	Oral.	7	0/2	1/2
1958 IV	*L. hollandicus.*	Oral.	7	0/7	7/8
1959	*K. galerita.*	Intramuscular.	28	0/21	12/20

The low infection rate meant that a very large number of birds would be needed to produce the number of positive reactors desired. It soon became evident that the local dealers could not supply birds in sufficient numbers. This difficulty was overcome to some extent by the cage infections reported below, but even so the number of birds finally tested was less than had been planned.

Frequency of Cage Infection.

A small epizootic occurred in a batch of cockatiels in May, 1958. When received from the dealer and tested, two of 29 cockatiels had agglutinating antibodies. Nine birds died between May 18 and June 4, and one died on June 30; typical inclusions of psittacosis virus were found in air-sac smears of two. Thirteen of 19 survivors subsequently were shown to have antibodies. Thus the 1958 feeding experiments included two groups—birds with antibodies on receipt, and birds in which antibodies developed while they were being held. Birds were not infected artificially in that period.

All of a group of 45 cockatoos, obtained in April, 1959, were sero-negative. None died, and by July antibodies had not developed. It was decided to infect some of the birds, in the hope that an epizootic might be started. On July 2, four birds were inoculated intranasally with allantoic fluid infected with a cockatiel strain of psittacosis virus isolated in 1958, and these birds were housed with the remaining 41 birds. On August 5, one of these four died with psittacosis; this was proven by the demonstration of inclusion bodies in air-sac smears. Two of the other infected birds, but no other cockatoo, had antibodies at that date. Illness and deaths commenced in mid-August, and continued to include some of 50 new cockatoos introduced on September 16. Only 55 of 95 cockatoos survived on October 30; 43 of the survivors had antibodies.

The high mortality among the introduced birds suggested that an experiment might be devised to test the prophylactic value of chlortetracycline fed to sero-negative birds exposed to infection in an infected aviary. A group of cockatoos was introduced on October 14, 12 of which were left as controls and 12 of which were fed antibiotic. Although 22 (12 controls and 10 treated birds) were sero-negative, and all were in the same room as the survivors of the epizootic described, only one control had developed antibodies by January, 1960, and psittacosis could not be isolated from any of the spleens.

Comparison of Complement-Fixation and Agglutination Tests.

Both complement-fixation and agglutination tests were used to select infected birds in 1958. The two tests, performed on cockatoo sera, gave results in close agreement. Twenty-nine of 105 cockatoo sera tested in the selection of birds for experiment gave positive results (the titre being greater than 1:8) to both tests, and 64 gave negative results to both. In 10 of 12 sera in which the results did not agree, the agglutination test gave positive results, and the direct complement-fixation test gave negative results. The agglutination test gave positive results in many more instances than the complement-fixation test on cockatiel sera, and fixation of complement by many sera, when it did occur, was incomplete. The indirect complement-fixation test was not used. Five of the first batch of cockatiels tested had agglutinating antibodies but no complement-fixing antibodies. Three were killed, and psittacosis agent was isolated from their spleens. Positive agglutination tests in cockatiels were therefore accepted as an indication of infection, past or present. A possible explanation of the differences is given in the section on the San Francisco studies.

TABLE II.
Effect of Treatment on Antibody Levels.

Species of Birds.	Route of Treatment.	Period of Holding After Treatment. (Days.)	Number Showing Fourfold Fall in Titre.	
			Complement Fixation.	Agglutination.
K. galerita.	Oral.	28	0/7; (0/7)[1]	6/8; (1/6)
K. galerita.	Oral.	7	0/3; (0/3)	0/3; (0/3)
K. galerita	Intramuscular.	28	12/21; (3/19)	
L. hollandicus.	Oral.	28		1/2; (1/4)
L. hollandicus.	Oral.	7		4/9; (2/9)

[1] Figures in parentheses give the number of control birds which showed a fall in titre.

Results of Treatment.

The route of treatment, holding period, and isolation rates from treated and control birds are listed in Table I. Psittacosis virus was not isolated from any of the treated birds, but was isolated from more than half of the controls.

The 21 birds in experiments I and II were bled three times during the period of treatment, and the serum was stored at −20° C. for later antibiotic assay. Chlortetracycline activity was manifest in the serum of all the treated birds, at levels of 0·5 to 1·0 μg. per millilitre, with a few levels as high as 3 μg. per millilitre. Activity was not detectable in sera from control birds.

Sera collected at the end of the experiment were tested for antibodies along with previously collected sera from the same birds. It was thought that the efficiency of treatment might be gauged from the fall of antibody titre. The number of treated and control birds showing fourfold or greater falls in titre is listed in Table II. Over the period of treatment the titre declined fourfold in more treated birds than in controls.

EXPERIMENTS AT THE HOOPER FOUNDATION.

While the studies were in progress at Brisbane, three shipments of Australian parrots were received in California. They were used in chemotherapeutic trials, and are part

TABLE III.

Results of Complement-Fixation (C.F.) and Capillary Tube Agglutination (C.T.A.) Tests of Australian Birds in Quarantine Before and After Treatment (Field Trial VI).

Number of Birds.	Species of Birds.	Titres.	Number of Positive Reactions.										Number of Birds Released.
			Before Treatment.		After Treatment.								
					10 Days.		96 Days.		148 Days.		221 Days.		
			C.F.	C.T.A.	C.F.	C.T.A.	C.F.	C.T.A.	C.F.	C.T.A.	C.F.	C.T.A.	
	Cockatoos:												
20	*Kakatoë galerita* (sulphur-crested)	512	0	0	1	0							13
		256	7	0	2	0							
		128	4	2	5	0							
		64	3	1	2	0	3	0	4	0	2		
		32	4	5	3	0	2	0	6	0	3		
		16	0	5	2	0	4	0	3	0	6		
		8	1	6	0	0	4	0	2	0	1		
		4	0	0	0	0	1	0	1	0	1		
		2	0	0	1	0	0	0	0	0			
		0	1	1	0	11	0	0	0	0	0	0	
11	*Kakatoë sanguinea* (bare-eyed)	64	0	1									11
		16	0	1	1				1	0			
		8	2	1	1		1	0					
		4	1	1	2								
		2	1	0			1	0	1	0			
		0	7	7	7	11	9	11	9	0			
11	*Kakatoë roseicapilla* (galah)	256	0	1									11
		128	0	1	1								
		64	0	1									
		32	1	0									
		16	0	2									
		8			1				1	0			
		4	0	1			1	1	1	0			
		0	10	5	9	11	10	9	9	0			
	Lorikeets:												
13	*Trichoglossus chlorolepidotus* (scaly-breasted)	0					13	13			13	13	13
18	*Trichoglossus moluccanus* (mountain)	0					18	18			18	18	18
	Rosellas:												
5	*Platycercus caledonicus* (green)	0					5	0			5	5	5
2	*Platycercus elegans* (crimson)	128							1	0			
		32									1	0	2
		16					1	0					
		0					1	0	1	0	1	0	
2	*Platycercus eximius* (eastern)	16					1	0	1	0			2
		0							1	0	2	0	
	Parrot:												
1	*Barnardius barnardi* (ring-necked)	0											1

of an unpublished series of field trials. The observations in connexion with these tests supplement the observations reported in the preceding paragraphs.

Field Trial VI.

On May 5, 1958, a zoological garden in Los Angeles accepted for quarantine 123 psittacine birds brought by boat from Sydney. The importer later related that some "Terramycin" preparation in water had been offered to the birds while in transit. On May 16, quarantine authorities at Terminal Island reported to the Hooper Foundation that some of the larger birds, which had been quarantined at Griffith Park Zoo in Los Angeles, had died, and asked that the Hooper Foundation determine the cause of death. The examination of 18 *Kakatoë galerita*, sent by Dr. W. A. Young, of the Zoo, revealed gross anatomical lesions suggestive of psittacosis, and typical *Bedsonia* were seen in smears prepared from the air sacs of a ring-necked parakeet (*Barnardius barnardi*). By the end of the 30 days' quarantine required by the United States Public Health Service, 25 parrots had died and the psittacosis virus had been isolated from 22. The quarantine was therefore extended indefinitely; the individual parrots were leg-banded, and all the large species were bled and then given oral treatment with chlortetracycline in a cooked chicken mash-rice mixture from June 23 until July 23. During the treatment period from June 29 to July 12 *Bedsonia* was isolated from four cockatoos (two *K. galerita*, one *K. sanguinea* and one *K. roseicapilla*) with gross lesions of enteritis.

Serological tests (Meyer and Eddie, 1956; Mason, 1959) of 42 out of 85 parrots bled revealed that 19 of 20 *K. galerita* had complement-fixation titres in dilutions from 1:8 to 1:256; four of 11 *K. sanguinea* had titres of 1:2 to 1:8. The serological findings on 11 *K. roseicapilla* were of importance; only one gave a complement-fixation reaction (at a dilution of 1:32), but six reacted in the capillary agglutination test in dilutions of 1:4 to 1:256. Since, in experimental studies conducted over five years, agglutination tests usually gave positive results several days to weeks before complement-fixation tests, it was concluded that the heavy psittacosis infection in the sulphur-crested cockatoos had crossed to other species while in transit from Australia, or while in quarantine (from May 5 to June 25). Complement-fixing antibodies, but no agglutinins, were demonstrable in the sera of the cockatoos on the tenth day after termination of the treatment.

The efficacy of the treatment was determined by examination of the blood and fæcal droppings for *Bedsonia*, by the following of antibody titres, and by the careful examination of the carcasses of parrots that died from injury or other undetermined causes during an observation period of 221 days. *Bedsonia* was not isolated from the droppings or the blood or the dead parrots; the antibody level dropped significantly (Table III) by the one hundred and forty-eighth day after treatment.

The entire collection of 88 parrots was transferred to the Hooper Foundation 90 days after their arrival in America, because the personnel at the Zoo was unable

ILLUSTRATIONS TO THE ARTICLE BY R. P. JEPSON AND R. A. RIEGER.

FIGURE I.
Post-operative arteriogram.

FIGURE II.
Curvilinear calcification seen with atherosclerotic aneurysm of the aorta.

ILLUSTRATIONS TO THE ARTICLE BY K. F. FAIRLEY, PRISCILLA KINCAID-SMITH AND AUBREY PITT.

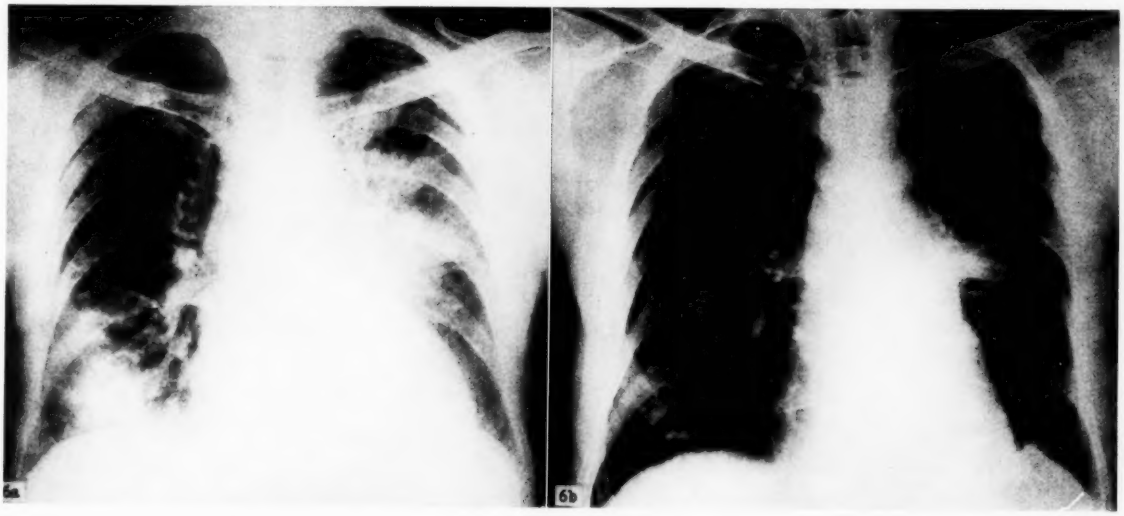

FIGURE VI.
A, before treatment with "Salco", July 25, 1960; B, after treatment with "Salco", August 3, 1960.

ILLUSTRATIONS TO THE ARTICLE BY R. R. STRANG, I. LJUNGDAHL AND D. TOVI.

FIGURE I.

Case 1: Large left parietal lesion with a geographical contour and marginal sclerosis.

FIGURE V.

Case II: Small punched-out lesion in the right parietal bone showing a faint marginal sclerosis.

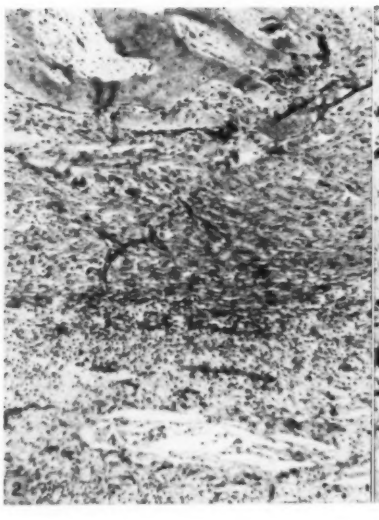

FIGURE II.

Case 1: Photomicrograph of the margin of the infiltrating lesion showing bone, underlying connective tissue and granulation tissue containing cholesterol crystal spaces. (Van Giesen, × 62.)

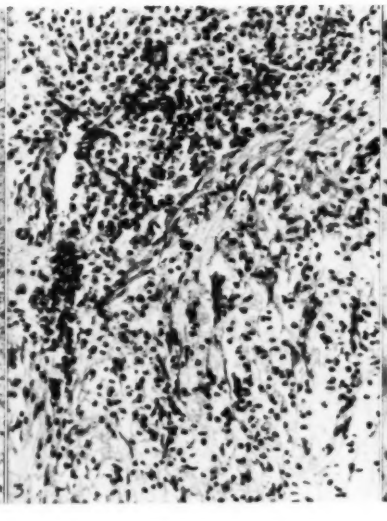

FIGURE III.

Case 1: Photomicrograph of the central portion of the granulation tissue showing the dense round-cell infiltration. (Van Giesen, × 62.)

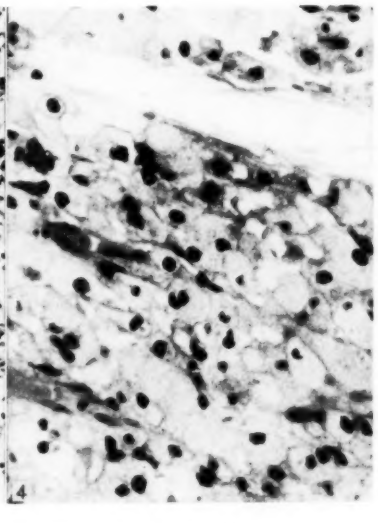

FIGURE IV.

Case 1: High-power view showing typical foam cells adjacent to a cholesterol crystal space. (Van Giesen, × 392.)

TABLE IV.

Results of Virus Isolation and Complement-Fixation Tests of a Consignment of Treated Australian Birds Before and During Shipment and in Quarantine at a Zoological Garden (Field Trial VII).

	Before Shipment.		In Transit.	On Arrival in Quarantine.		After Treatment.	
	C.F.+/No. Tested.[1]	V.I.+/No. Tested.[2]	V.I.+/No. Tested.	C.F.+/No. Tested.	V.I.+/No. Tested.	C.F.+/No. Tested.	V.I.+/No. Tested.
Cockatoos :							
Kakatoë roseicapilla (galah, rose-breasted) ..	5/24	—	0/17	0/7	—	0/6	—
Kakatoë sanguinea (bare-eyed corella) ..	18/20	1/2	—	11/17	0/1	5/16	0/1
Kakatoë galerita (sulphur-crested)	5/36	2/5	0/5	3/23	0/5	2/18	0/3
Kakatoë leadbeateri (Major Mitchell)	3/8	0	1/3	2/3	0/2	0/3	0/1
Total	31/88	3/7	1/25	16/50	0/8	7/43	0/5
Rosellas :							
Platycercus eximius (eastern)	0/17	—		0/9		0/4	0/5
Platycercus icterotis (western)	1/2		0/9	0/1	0/5	0/1	
Platycercus flaveolus (yellow)	1/2	—		—		—	—
Unidentified	0/3	—		0/3		0/1	0/2
Total	2/24	—	0/9	0/13	0/5	0/6	0/7
Pet parrots	—	—	—	0/4	—	0/4	—

[1] C.F.+=complement-fixation titre of 1:4 or above.

[2] V.I.+=virus isolated.

to bleed the smaller species. A crimson rosella (*Platycercus elegans*) had a high level of complement-fixation antibodies, and an eastern rosella (*P. eximius*) had a low titre. The 41 small parrots were treated for 30 days. While they were under subsequent observation for 125 days, several examinations of droppings or the carcasses of 12 parrots which were killed or had died from various causes (for example, enteritis or nephritis) failed to demonstrate the psittacosis agent. The antibodies gradually declined. Since all the tests indicated that the psittacosis infection had been eradicated, permission was granted by the Quarantine Service to transfer the remainder of the importation to a private bird collection in Florida. According to reports from there, two *K. galerita* have died, but psittacosis virus was not isolated from the tissues.

Field Trial VII.

This field trial was arranged in order to observe infected birds collected by a commercial bird dealer and shipped through ordinary channels without professional supervision, and to learn whether they could be freed of infection by oral treatment on board ship.

Dr. Stephen Hunt collected blood samples from 112 birds before shipment from Sydney, and sent them to the Hooper Foundation, where they were tested for complement-fixation reactions. Seven birds that had died were also sent, and virus isolation tests were made, confirming that the birds were infected. Before shipment the birds were given medicated mash for 11 days; for the 21 days of the voyage they were given medicated mash (10 mg. of "Terramycin" per gramme of feed) or water (10 mg. per gallon) by ship personnel. About one-third of the birds died during the voyage, and more had died by the time the shipment reached San Diego Zoo, where the survivors were quarantined and treated. They were given medicated mash (10 mg. per gramme) for 50 days. This intensive treatment was given because of the extent of the infection, and in order to observe its effects on the birds and on the serological reactions. Two groups of blood samples were sent for the complement-fixation test while the birds were in quarantine. As the last blood samples were being collected, a month after treatment was terminated, 12 birds were accidentally killed. None yielded *Bedsonia*, and only seven of 53 survivors had complement-fixation titres in their blood, none exceeding 1:32. Examination of fæcal droppings did not reveal *Bedsonia*. The results of complement-fixation and virus isolation tests at the Hooper Foundation are given in Table IV.

It was concluded that the treated birds without antibody titres could be released, and these were distributed to several zoological gardens. According to reliable reports, no relapses have been observed, nor has there been clinical evidence of new infection among their collections.

Field Trial VIII.

In April, 1959, a consignment of 18 Australian psittacine birds purchased by a bird collector in New Jersey was received at the San Francisco airport. One rosella (*P. flaveolus*) had died *en route*. At autopsy psittacosis was revealed by microscopic examination and by the isolation of *Bedsonia*. The United States Public Health Service transferred the remaining 17 parrots to the Hooper Foundation for study and treatment. Serological tests suggested chronic latent infection in the cockatoos and acute infections in the rosellas (*P. adelaidæ*, *P. caledonicus* and *P. elegans*). Aside from high agglutination titres, several of the rosellas suffered at the time of arrival from viræmia; this fact suggested that they might have recently acquired infections from the cockatoos. The birds ate the medicated mash with good appetite, and the daily intake was high, resulting in blood levels of from 0·4 to 6·3 μg. per millilitre of blood (Table V). The method of measuring antibiotic activity was the same as the one used at the Queensland Institute. One rosella, which had suffered from viræmia at the beginning of treatment, was accidentally killed while being bled for a drug assay. A searching examination of the tissues yielded no psittacosis virus. One month after the treatment was completed, the antibody titres had dropped a little; virus was not demonstrated in the blood or the fæcal droppings. After two months' observation, the colour of the feathers had improved and the birds looked to be in excellent health, and were transferred to the collector, who has reported that they and the rest of the birds in the collection have remained well.

DISCUSSION.

In these studies in Australia and the United States, several species of Australian psittacine birds (white sulphur-crested, rose-breasted and pink cockatoos, cockatiels and rosellas) naturally infected with psittacosis were

TABLE V.

Results of Treatment of Consignment of Smuggled Australian Birds Treated with Medicated Mash (10 mg. "Terramycin" per Gramme of Feed) (Field Trial VIII).

Species of Birds.	Amount of Mash Given. (Mg. per Kilogram per Day.)	Range of Blood Levels of Drug Obtained. (µg. per Millilitre.)	Extent of Infection.						
			Before Treatment.			At End of Treatment.		One Month after Treatment.	
			C.F. Antibody Titre.	C.T.A. Antibody Titre.	Viræmia.	C.F. Antibody Titre.	C.T.A. Antibody Titre.	C.F. Antibody Titre.	C.T.A. Antibody Titre.
Cockatoos:									
Kakatoë galerita (sulphur-crested)	971	0·40–0·57	1–1 : 32 1–1 : 4 1–0	3–0	0/3	1–1 : 16 1–1 : 4 1–0	3–0 :	1–1 : 16 1–1 : 4 1–0	3–0
Kakatoë leadbeateri (pink) ..	1250	1·6 –6·3	1–1 : 256 2–1 : 64 1–0	1–1 : 64 1–1 : 16 2–1 : 8	0/4	1–1 : 16 1–1 : 8 2–0	4–0	1–1 : 16 1–1 : 8 2–0	4–0
Parrots:									
Purpureicephalus spurius (red-capped)	124·2	1·2	2–0	2–0	0/2	2–0	2–0	2–0	2–0
Rosellas:[1]									
Platycercus adelaidæ (Adelaide)	236	0·53–0·88	1–1 : 256 1–1 : 64	1–1 : 8 1–0	1/2	2–1 : 64	2–1 : 4	1–1 : 64	1–1 : 8
Platycercus caledonicus (green) .	260	0·4 –1·0	1–1 : 512 1–1 : 256	1–1 : 32 1–1 : 16	2/2	2–1 : 32	2–0	1–1 : 256 1–1 : 32	1–1 : 16 1–0
Platycercus elegans (crimson)	810	1·1–2·2	2–1 : 512	1–1 : 64 1–1 : 32	1/2	1–1 : 64 1–1 : 32	2–0	1–1 : 64 1–1 : 16	1–1 : 8 1–0
Lorikeets:									
Species possibly *Polytelis swainsoni*	600	1·1 –1·5	2–0	2–0	0/2	2–0	2–0	2–0	2–0

[1] Virus was isolated from one *Platycercus flaveolus* dead on arrival.

freed from demonstrable psittacosis virus by chlortetracycline administered orally or intramuscularly. The findings are similar to those of Meyer and Eddie (1955) and Meyer *et alii* (1958), and to those in unpublished experiments with South American parrots by the same investigators. Similar results have also been obtained, primarily by the use of intramuscular injection of chlortetracycline in sesame oil, by Pollard (1959*a*, 1959*b*), and by Bussell and Pollard (1958).

The experience of the American authors of this paper, in the present and previously reported studies, and in unpublished field trials, is now sufficient to allow definite statements on some of the practical details important in the treatment of infected parrots with antibiotic. Thus, the presence of infection may be demonstrated by serological tests, or by the isolation of *Bedsonia* at autopsy, or from blood or fæces during life. Viræmia and high agglutination titres indicate acute infection, but agglutinins are commonly absent in chronic latent infections, especially of cockatoos. The efficacy of drug treatment with tetracycline compounds may be measured by the absence of the virus from the tissue at autopsy or from the fæces, and by the absence of relapses. The fall in antibody titre after treatment may be of value in indicating the success of treatment in groups, but cannot be applied to individual birds, as virus has been isolated from sero-negative birds. Medicated mash, which must be prepared daily, is now considered preferable to medicated hulled seeds for the oral therapy of large birds. Their appetite for the mash is excellent, and an intake even exceeding 1 gramme per kilogram per day has not caused side-effects. The procedure of intramuscular injection of tetracycline in sesame oil appears to be effective, but requires further appraisal on large groups.

Meyer *et alii* (1958) have described in detail possible public health measures that could be based on this work, and many of their comments are applicable to Australia. Three special instances may be discussed.

1. The low rate of infection in Australian birds in their native state, the occurrence of epizootics when groups of birds are introduced into aviaries, the high infection rate in birds held in aviaries and the frequent association of human psittacosis with aviaries all underline the importance of the dealer's aviary in the epidemiology of psittacosis. Antibiotic treatment to eradicate infection in aviaries might be expected to lower the risks of infection to bird handlers and dealers, reduce the loss of birds arising from cage epizootics and prevent the introduction of infected birds as pets into family groups.

2. Treatment of newly-acquired pet birds with antibiotic, either by injection or by medicated mash freshly prepared each day, would remove the risks of family infection. This should be supervised by a veterinary surgeon; unsupervised treatment is considered unlikely to be efficient (see Fields Trials VI and VII).

3. Treatment of birds before shipment or export would be expected to reduce losses from cross-infection, and to remove a major health hazard to people handling the birds. From 34% to 95% of Australian cockatoos shipped to the United States have been found to be infected. This aspect of the epizootiology of the cross-infection in psittacine birds is particularly well illustrated in Field Trials VII and VIII. Recent legislation in Australia prevents the future export of fauna for commercial purposes, but it is probable that small shipments for scientific purposes will be made. Such birds should be treated with antibiotic before they leave Australia.

The import of birds to the United States from other countries will continue to present problems, and it is understood that the Quarantine Service of the United States Public Health Service is planning to develop treatment centres in the countries supplying the trade with large parrots.

Certain problems remain to be solved. The Communicable Disease Center (1960) recently stressed the risks to those giving injections to infected birds. Meyer *et alii* (1958) point out that latently infected birds may lose their immunity to reinfection after treatment. Thus, even if aviaries were freed of infection, the risk of reinfection would arise each time new birds were introduced. This problem could be overcome by holding new birds in a separate room until they had been satisfactorily treated with antibiotic. Such a regimen, to be effective, would require active cooperation from the dealers, and measures to educate them in the chemoprophylaxis of psittacosis might well be considered.

SUMMARY.

Sixteen of 131 white cockatoos (*Kakatoë galerita*) and 23 of 89 cockatiels (*Leptolophus hollandicus*) had antibodies to psittacosis when purchased from commercial dealers. The antibody rates in birds received within a few days of capture was nine of 123 and seven of 59 respectively.

Cage infection was frequent; one small epizootic occurred naturally, and a larger one was induced by infecting a small number of birds.

Complement fixation and capillary tube agglutination tests gave results in close agreement on cockatoo sera. The direct complement fixation test did not give satisfactory results for cockatiel sera.

Psittacosis virus could not be isolated from 11 cockatiels fed on chlortetracycline for 20 days, or from 21 cockatoos treated with chlortetracycline by intramuscular injection. The virus was isolated from more than half of a similar number of controls.

Some evidence was found that antibody levels tended to fall more quickly in treated birds (after treatment) than in untreated birds.

Experience is also reported with the treatment of three batches of Australian parrots imported into California in 1958 and 1959. Deaths due to psittacosis occurred in each batch before, during or after shipment. Survivors were shown to be infected by serological tests and by the isolation of virus from the blood or the fæces. Oral treatment with antibiotic was followed by the disappearance of virus from the fæces and a fall of antibody titres. Treated birds were eventually released to various zoos in the United States, without any further mortality from psittacosis in these birds or their contacts.

ACKNOWLEDGEMENTS.

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INTRACTABLE PAIN—PSYCHIATRIC ASPECTS.[1]

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Introduction.

PAIN and the psyche are closely connected and one may profoundly affect the other. This is why there is no single objective way to measure the severity of pain in an individual patient. Real pain cannot be distinguished from imaginary pain because it is so subjective, and to the patient the only true pain is that which he feels. No other person can judge the intensity accurately. The physician must rely on the patient's statements, his reaction to his pain, and above all, an appraisal of his personality, for both the descriptions given and the reactions depend largely on the psychological background.

Pain is a signal that something is wrong with the structure or functional integrity of the body. It has protective function only as long as it helps the individual avoid harmful agents that jeopardize his health and safety. It is a sensation which, like anxiety, the normal individual dedicates himself to avoid. However, individual reaction to pain varies enormously, and what pain means to one person is no indication of its meaning to another. What I wish to stress particularly is that pain and suffering are not synonymous—a mild pain may cause much suffering because of what it means to the patient. In my experience, patients who complain of pain almost always have a physiological basis for the complaint, even though neurotic mechanisms may greatly aggravate the symptom and result in over-reactions, which can become incapacitating.

Whilst intractable pain causes great emotional and psychological stress to patients and relatives (and often the doctor), there can be little doubt that a high percentage of patients with psychogenically induced pain are being treated symptomatically, with or without an awareness on the part of the doctor of the true underlying mechanisms involved. Where the emotional problems are recognized and ignored, the doctor really aids and abets the neurosis and the patient frequently, though unconsciously, agrees to be fooled.

Some Physiological Considerations.

The final effects of pain depend on the mental attitude and the mood of the patient and the interrelationship between the perception of and the reaction to the painful stimulus. There is very little variation in the threshold of pain perception from one individual to another or in the same individual from day to day (though it varies from place to place on the body). It is the individual variations in response to painful stimuli once they have reached the sensorium which accounts for the striking differences in behaviour by humans to the ordeal of pain.

So the point I wish to emphasize here is the distinction between pain perception, which depends chiefly on simple neural connexions, and reaction to pain. The reaction to pain is modified by the highest cognitive functions and depends in part on what the sensation means to the individual in the light of his past life experience. For example, the pain sensation is often associated with a reaction of anguish or displeasure, and these strong

[1] Delivered at a meeting of the Section of Neurology, Psychiatry and Neurosurgery of the New South Wales Branch of the British Medical Association in September, 1960, at Sydney.

feeling states may predominate in the pain experience, becoming to the patient the most relevant aspect of the pain. Many of the connexions which give pain experience their meaning peculiar to the individual may be in the nature of relays and circuits which have been laid down in the cerebral cortex in the course of past experience.

We know little of the complex processes that are necessary to perpetuate pain once it has started abnormal reactions at higher levels. The pain is probably accounted for by a complex of activated neurones set off by sensory stimuli from the periphery and modified and conditioned by central mechanisms, so that some central activity goes on long after the peripheral stimulation has ceased. Old associations are awakened and responses previously conditioned by past experience are aroused, and we know the more one acts in the light of experience, the more intellectual is the response.

Perception of Pain.

The threshold for perception of pain, which I have said is approximately the same in all subjects, is raised by the administration of analgesics, suggestion (in the form of placebos, hypnosis and certain mystic and religious practices) and distractions which alter the attitude of the subject—for example, athletics and battle. Consider the toothache at 2 a.m., when there is no solace from distractions and introspection is increased. The question of attention to and anticipation of pain is very important. Normal people have mechanisms which constrict the field of consciousness so that the object at the centre of interest is perceived intensely, whilst all others may be only vaguely sensed. This takes place at a high cerebral level and sorts the stimuli out, deciding which should receive the spotlight of attention. A mass of impressions are received and registered, but only a few are consciously remembered. Those that have most attention are remembered the longest. It is well known that a person who is happy and active can tolerate pain much better than a person who is lonely and psychologically impoverished.

Reaction to Pain.

What a patient feels, thinks or does about a pain is his reaction to it, and unlike perception, it varies greatly for given individuals and for the same individual under differing circumstances. This variation depends largely on the past life of the individual, his personality and the specific associations which exist, both conscious and unconscious; these may include past experiences which are related or fantasied. When a patient has been emotionally unstable, over-anxious or hypochondriacal before an illness or injury, pain may be assimilated directly into the conditioned emotional response system and becomes a focal point of that system. Each person has his own scheme by which to judge a stimulus as painful or not, and each subject's reactions to such stimuli are governed by conditioned emotional responses that have been developed from early childhood. The pain that a child experiences is often conditioned by the fears and attitudes and afflictions of his parents. The parental attitude of indifference can often have as much influence as one of over-reaction.

Conditioning may play a part in the fact that sometimes sick men used to much illness and suffering may tolerate a good deal of pain, whereas robust men may over-react to a sudden painful illness (with much fear).

For many, the concept of psychogenic pain—that is, pain with no end-organ stimulation—is vague and mysterious. When it is possible to verify the presence or absence of a peripheral source of stimulation in studying sensory experience (such as with vision and hearing), the physician has no difficulty in identifying examples in which no peripheral stimulation occurs (that is, hallucinations). However, identification is always more difficult with pain sensation because of its subjective nature, yet there are many examples of hallucinatory experiences involving the more common modalities of sensation.

Psychodynamic Factors.

Whatever the origin of the painful impulse, the input pattern will be modified and elaborated at different levels of the central nervous system.

Most of our troubles with the interpretation of more complex pain syndromes have been due to the fact that the processes are indissolubly bound up with the personality of the sufferer. Pain, in the final analysis, is a psychic phenomenon, and it becomes imperative to know the needs and conditioning of patients if we hope to have understanding of the significance of long-standing pain, especially that of obscure origin.

Pain-Prone Patients.

There are certain pain-prone individuals amongst whom psychic factors play the primary role in the genesis of the pain, in the absence as well as in the presence of peripheral stimulation. The concept of pain being induced psychogenically is not a denial of the "pleasure-pain" principle, which holds that the activity of the mental apparatus is directed by the individual to the attainment of pleasure and the avoidance of pain. There are situations in which pain is necessary or desirable to maintain equilibrium, and in a distorted way gives quasi-pleasure—pleasure in a relative sense—that is, in place of something even more distressing.

The normal emotional reactions of a person to pain are: (i) to take appropriate measures to avoid it; (ii) to react appropriately in kind and degree. A morbid or emotionally pathological reaction exists where deviations from these norms take place. These deviations can take the following directions.

Firstly, instead of avoiding pain, the individual seeks or produces it. This is seen in masochism, where pain has been eroticized, or in people in whom pain satisfies the feeling of guilt and the need for punishment, as in certain depressive and obsessive states. Pain is also welcomed where it stands for some other need. In these cases, unlike masochism, it is not suffered for itself, but is an unavoidable evil which is tolerated to enjoy some associated gratification, such as a need to be taken care of.

Secondly, inappropriate reactions may take place to unavoidable pain—for example the pain of somatic disease—or to the anticipation of pain. In these cases pain has a specific symbolic meaning which disturbs the equilibrium. It may reawaken old threats of castration or of being abandoned to one's fate. Thus pain may mobilize an old, latent, unconscious conflict and provoke a neurosis in a formerly compensated and apparently well-adjusted individual. However, in some cases this mechanism can act in reverse — for example, when the pain of a somatic disease, by answering an unconscious need to suffer or to be cared for, in fact reduces or prevents a neurosis.

The pain-prone patients are not a homogenous group, but they have many features in common. They repeatedly or chronically suffer pain or some painful disability with or without some recognizable physical change. They are chronically guilt-ridden, depressive, pessimistic, gloomy and self-deprecatory, and often drift into situations in which they are hurt, beaten, defeated or humiliated, yet they never seem to learn by experience (moral masochism). They frequently fail to exploit situations which lead to success and do badly when success is thrust upon them. They are at their best health when life is treating them worst. Unconsciously they do not feel they deserve success. Pain to them is a comfort and an old friend, and there is usually a marked disparity between the pain they describe and their well-being. They often display obvious relish as they relate their suffering and calamity. Their need is to be pitied, to be succoured or to be a martyr.

Injuries and operations abound in their histories (usually described in medical jargon), and they even solicit from their doctors the infliction of further pain.

Assessment of Symptoms.

Time spent early in assessing chronic pain is extremely important and one should guard against expecting quick and dramatic cures with drugs or surgery. One should learn just what brought the patient under medical care originally and follow this by an assessment of the patient's emotional constitution, his adjustments that preceded the onset, and the setting in which it occurred. Only in this way can we assess the way in which psychological processes are operating to determine the ultimate character of the pain-experience for the patient. At this point I would like to list some of what one might term neurotic indicators.

Manner of Communication.

A general rule is that the more detailed and dramatic the description of the pain, the greater the psychogenic element in the case. When asked about the pain, these patients can be notoriously circumstantial and vague and refer constantly to their pain as "it". They can frequently talk for 45 minutes without describing the pain, but telling the names of all the doctors they have seen, quoting word for word what was said, and listing all the pills prescribed without benefit. When time relations are sought, these are equally vague ("years and years") or the pain may be related to some emotionally significant event ("just after Jonathan was born").

The free use of metaphorical language and superlatives is also common, although one cannot conclude that every patient who gives these descriptions does not possess some peripheral lesion. He may have such a lesion, but disordered patterns arising from it are subject to the most complex psychic distortion and elaboration. However, one can generally say that the more complex is the ideation and imagery involved, the more complex are the psychic processes involved in the final pain experience.

One must be particularly careful of the chronic sufferer who starts by saying "doctors are wonderful", with a happy smile, and then proceeds to explain that "they've really done nothing for me", at the same time attempting to manage and manipulate them. These people are experts at playing one doctor against another, just as they do with members of their family, and just as they have done with their parents.

Some individuals are prone to express their dissatisfaction and frustrations through complaints of pain, which then may display some symbolism—for example, "my head" equals "my mind"; "my heart aches" means "I'm broken hearted"; "I can't hold my head up because of pain" means "I'm ashamed"; "I can't straighten my back because of pain" means "I'm bowed down with worry or the burden of responsibilities".

Associated Affect.

Symptoms which are associated with considerable changes in mood and pains which are themselves subject to profound changes in intensity are often neurotic indications. In some the cheerful appearance may not be at all in keeping with the crippling descriptions. In interviews and hospital situations passive, dependent behaviour can be just as significant as immature, attention-seeking and demanding attitudes.

Past History.

Patients' neurotic patterns in their reactions to earlier stress or pain can give important clues. Caution is especially needed in dealing with those who have a past history of "polysurgical addiction"—those who, with little affect, seek and submit to one operation after another, who often have a high incidence of complications after operation and whose pains become worse after operation.

Pain Location.

The incongruity between the pain characteristics as described by the patient and the known patho-physiological or patho-anatomical processes is in itself sufficient grounds to question a purely physical interpretation for the pain. Psychogenic pain location is more commonly expressed in terms of the patient's concept of his body image as contrasted to pain location determined by the distribution of sensory nerves. This disturbance of body image is seen in some cases of schizophrenia and accounts for some of the bizarre hypochondriacal descriptions encountered in that disease. Variations in pain location and the incompatibility between complaints and function are more typical of the neurotic or simulator, as is exaggerated tenderness over the area involved.

The choice of site for a chronic painful syndrome may be determined by (i) a peripherally-provoked pain experienced by the patient at some time in the past and which fulfils some psychic role or need (this may be seen in some post-operative and post-traumatic cases); (ii) a pain actually experienced by someone else, or a pain the patient unconsciously imagined or wished the other person to experience. This other person is, of course, one who is important to the patient either because he is one with whom the patient has some conflict or because he is one from whom the patient has been or may be separated; or it may be someone with whom the patient is closely identified. This can often be revealed if the important people in the patient's life are investigated.

Response to Medication.

In my experience both psychogenic and true peripherally-produced pain can be relieved by narcotics and by distilled water, and the mere fact that the latter gives relief does not exclude the presence of peripheral pain. However, the neurotic and emotionally disturbed patient becomes more quickly dependent on strong analgesics and more demanding of their administration.

The Stated Cause.

The neurotic, when asked for his view of the cause, will often answer "worry" or associate the onset with some emotional stress or state of "exhaustion". He will more likely spontaneously complain of his lot in general and tell of some work, duty or pleasure that his symptom prevents. One word of caution is needed here, and that is that a really physically ill patient can exaggerate if he feels he is being ignored, and his apparently hysterical behaviour may merely represent his own way of pleading for help.

Differential Diagnosis.

Malingering and Neurosis.

The line between malingering and psychoneurosis is often difficult to draw. It depends on how deliberately the deception is practised. A neurotic is more or less unaware of his motivation. However, it is almost impossible to classify the intergradations. A malingerer who is perfectly conscious of his faking may not understand what drives him to behave in this way and his simulation may be the expression of a basic character disorder. Feigned pain may signal the drug addict who is seeking his drug. It is rarely if ever true that a patient "imagines his pain". Some pain, however slight, is almost always the basis. Most people get pains which are ignored because they are leading active and satisfying lives. Others who have an associated psychological problem develop anxiety, doubts and depression, which cause the pains to bulk larger, and with increased introspection more attention and energy is focused upon them, resulting in an incapacity out of all proportion.

Conversion Hysteria.

The neurotic conflict is resolved by "materialization". An idea is translated into a physical symptom. Most neurotic cases of chronic pain fall into this group and often show previous evidence of hysterical symptoms, together perhaps with evidence of acting-out behaviour and an affect of *la belle indifference*. The choice of symptom formation may be determined by the *locus minoris resistentiæ* (the site of previous pain or injury).

Depressive States.

Chronic pain not uncommonly masks a depressive illness. A common error by doctors is to assume that the patient

is depressed because of the pain. The pain, actually inflicted by the superego, serves to mitigate the feeling of guilt and shame of the depressive and it may be even protecting the patient from more intense depression and even suicide.

Hypochondriasis.

Hypochondriasis is a borderland or transitional state between neurosis and psychosis. Many of the complaints of these patients begin as elaborations of and over-reactions to normal physiological processes, or to the autonomic manifestations of tension. Gradually, with more attention and introspection, the symptoms spread and involve many systems. A narcissistic fixation develops as interest is turned on the self and away from the environment, with which such subjects have ever had a very flimsy and superficial external object relationship. As the insidious course develops, the metaphorical terms applied to the pain become to the patient established fact and so a real delusion is established and an increasingly bizarre picture emerges, ending in complete megalomanic preoccupation. The hypochondriac communicates his pain with intense persistence, concern and urgency, with a quality of being persecuted by it. He is more often concerned with the interpretation of his pain than the pain itself ("Is it cancer?"). This syndrome is more often closely allied to schizophrenia.

Schizophrenia.

In schizophrenia bizarre pains and changes in body experiences form part of the delusionary system based on disturbances of body image. Here the pain is unrelenting, annoying, inescapable and persecuting. The orifices seem to figure prominently in these complaints.

Management.

The management of the patient with intractable pain is a constant challenge to the doctor, demanding the utmost patience, understanding and clinical judgement, as such pain impairs a patient's ability to work and to think clearly, prevents sleep, abolishes appetite, lowers morale and may destroy his will to help himself survive.

A good relationship with the doctor is a most important thing in management. Some relief of suffering is often experienced by the patient who is in sympathetic contact with the doctor and much anxiety and uncertainty is relieved if the disorder can be given a name. There is some danger in watching pain without suffering it. It may well leave us cold or involve us to the other extreme—neither condition is propitious for the patient or the doctor. Some doctors have trouble with these patients on account of their own unconscious attitudes.

Confusion is compounded if trickery is adopted with distilled water injections and other devices. It then becomes hard to see who is the more disturbed, the patient or the doctor.

Many a neurotic nuisance is fostered by the doctor's attempts to save himself time and trouble. However, where there is no succour, the pain of the patient may become his symbol of rejection and his complaint becomes a retribution to the doctor who does not answer his cry for help. Even when the prognosis is poor, one should never say: "There is nothing more I can do for you."

Success of neurosurgical procedures is very closely related, not only to the surgeon's skill and his knowledge of the source and mechanism of the pain, but also to his knowledge of the patient's temperament and past life adjustment. Patients who are unduly body-conscious, and whose suffering is largely a matter of over-reaction to low-intensity stimuli, are likely to fix their preoccupation on the post-operative state and may be made more miserable by surgery.

Leucotomy or resection of the corresponding cortical areas suppresses the awareness of suffering and the concern over incurable illness and the reactive expression of pain, but does not actually raise the sensory threshold. There is often a sacrifice of certain qualities of personality and few such patients ultimately become self-supporting. Leucotomy is only for those patients with no other hope and should not be a first choice. It is chiefly for those whose pain is too diffuse or too high to benefit from more conservative measures. These operations are for suffering, not for pain. If pain is severe, but there is little psychological upset in the form of suffering, the results are unsatisfactory.

An addiction to a drug stems largely from its ability to relieve anxiety and induce a state of relative detachment. It has been said that the presence of pain reduces the psychological effects of morphine, and that addiction is less readily acquired by people suffering from sustained, intensely painful conditions. The use of phenothiazine derivatives seems to have been of proven benefit to many of these patients in relieving the emotional reactions and producing a state of detachment without the depressant effects of the narcotics.

One of the commonest reactions of patients with pain is a passive dependency on the doctor and on drugs which tends to foster habituation. Part of the treatment must be to turn the passive attitude of: "I want you to give me relief", into an active attitude of: "I will occupy myself and take an interest in other people so that my pain is not the centre of my attention." Physiotherapy and occupational therapy can help here, and psychotherapy can often show the patients that their passive desire to be cared for and relieved is but a repetition of childhood reactions.

Conclusion.

Symptoms serve a purpose for many patients who harbour them and it is often unwise to remove these symptoms recklessly and prematurely before a more suitable solution by the patient is within his power. A symptom may protect against a further regression and against his having to yield to a more diffuse and widespread psychopathological state. In the treatment of suffering, a complex entity, the personality is being attacked; and on the concept of suffering, the question whether the pain is described as a sensation, a perception or an emotion becomes quite relevant.

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Reports of Cases.

EOSINOPHILIC GRANULOMA OF THE SKULL.

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THE bone lesion called eosinophilic granuloma by Jaffe and Lichtenstein in 1940 was described independently in the same year by Otani and Ehrlich, who referred to it as "a solitary granuloma of bone simulating a primary neoplasm". The lesion had been recognized earlier by Fraser (1935), who regarded it as "an early phase of a granulomatous lesion".

Otani and Ehrlich (1940) noted a histological similarity between eosinophilic granuloma and Hand-Schüller-Christian's disease, and a clinical relationship between these diseases and Letterer-Siwe's disease was established by Green and Farber (1942). The histopathological relationship between these three diseases was described

by Jaffe and Lichtenstein (1944), who called them collectively histiocytosis X.

Eosinophilic granuloma of bone, which is the most benign member of the triad, is quite rare as an isolated lesion. Hill (1949) collected 72 cases, and since his paper a further 32 cases have been reported. At this clinic, where the admissions average between 900 and 1500 a year, only two cases have been encountered between the years 1928 and 1958.

It occurs most commonly in the skull (over 50% of cases according to Hill, 1949), less frequently in the ribs, pelvis and vertebral column and rarely in other bones. Membrane bones are more commonly involved. Usually one, but occasionally several, bones are affected.

Children and young adults are the usual sufferers and the ratio of males to females is given as 5:1 by Dundon *et alii* (1946).

The cases reported here occurred in young adult males and in each case the anterior part of the parietal bone was involved.

Case I.

Clinical Record.

The patient was a male, aged 17 years. Fifteen weeks prior to his admission to hospital he was struck on the left frontal region of the head while playing football. He did not lose consciousness, but rather severe localized pain in this region persisted for one week. It disappeared spontaneously. About a month before his admission he detected the presence of a readily palpable ridge of bone in the same region. It was roughly circular in shape and the lower part of the enclosed area felt as though it was depressed below the level of the surrounding skull.

On his admission to hospital, the patient's general physical examination was normal except for the palpable ridge and depressed area in the left frontal region. This measured 5 by 3·5 cm. and was situated midway between the skull base and the mid-line of the vertex. The blood pressure was 140/90 mm. of mercury.

Results of Laboratory Examinations.

Laboratory investigations revealed a hæmoglobin level of 86%, with 4·4 million erythrocytes per cubic millimetre. The white cells totalled 4500 per cubic millimetre, with 57% neutrophils, 35% lymphocytes, 2% monocytes and 8% eosinophils. The Wassermann reaction gave a negative result. The cerebro-spinal fluid was clear and colourless, contained no cells and gave a negative result to the Pandy test.

An X-ray examination of the skull several days after the accident revealed the presence of a large defect in the left parietal bone immediately behind the coronal suture. It was considered to be an epidermoid. An X-ray film of the skull taken on admission to hospital disclosed that the defect had increased in size, and had an irregular, sclerotic margin and a polycystic appearance (Figure I[1]). The outer table was destroyed and the inner table, at least in the lower part of the defect, was thin and displaced inwards.

A pneumoencephalogram showed a normal ventricular system.

Operation.

A small skin flap was turned over the lesion and revealed the eroded area, in the centre of which the dura was visible. The defect was partially filled with granulation tissue. A wide area of bone well peripheral to the margin of the defect was removed. The dura was thickened and adherent to the granulation tissue. A cranioplasty was performed to cover the area of removed bone.

The patient has remained in excellent health since his discharge from hospital.

Pathological Examination.

The decalcified material was composed of sclerosed granulation tissue infiltrated with lymphocytes, plasma cells and many eosinophils. In places the tissue had a very loose texture. There were small areas of necrosis, occasional giant cells, needle-shaped crystals of cholesterol and typical foam cells (Figures II, III and IV).

The diagnosis was made of eosinophilic granuloma.

Case II.

Clinical Record.

The patient was a male, aged 29 years. His hereditary and social history was non-contributory. In 1938 he sustained a skull trauma which resulted in unconsciousness for several hours and which required his treatment in hospital for three weeks. Between 1946 and 1948 he had frequent attacks of severe headache, mostly localized in the frontal region. In January, 1956, he developed pain of aching character and a tender swelling in the right posterior frontal region. This area was raised about 0·5 cm. above the surrounding skin surface and measured 3 cm. in diameter. At the end of February the pain disappeared, but the tenderness remained. At the beginning of April the swelling disappeared, but the palpable tenderness persisted until the patient's admission to hospital. He was admitted to this clinic in April, 1956.

The findings on general physical examination were normal except that in the region of tenderness a palpable depression could be felt in the bone. The blood pressure was 120/80 mm. of mercury. The erythrocyte sedimentation rate was 10 mm. in one hour. The hæmoglobin level was 81%. The erythrocytes numbered 4 millions per cubic millimetre and no differential white cell count was obtained. The blood urea nitrogen level was 34 mg. per 100 ml. The patient's vision was normal.

An X-ray film of the skull revealed a defect measuring about 2 cm. in diameter in the right parietal bone (Figure V). The bone destruction was irregular and the lesion was thought to be a hæmangioma. An X-ray film taken in 1948 was normal.

Operation.

A vertical skin incision was made centring over the palpable depression. The underlying altered bone was brownish-red in colour, soft and quite vascular. This area was removed, together with a peripheral margin of healthy bone. A small acrylic cranioplasty was made to cover the resultant defect.

Pathological Examination.

Between islands of newly formed bone there was a large amount of hyalinized connective tissue and osteoid tissue densely infiltrated by eosinophilic leucocytes. There were occasional lymphocytes and plasma cells. No cholesterol crystals, foreign-body giant cells or foam cells were observed. The diagnosis was made of eosinophilic granuloma. Apart from slight discomfort in the area of operation, noted particularly in cold or very hot weather, the patient has remained well for three years. Periodic examinations have failed to detect recurrence or the evolution of a new lesion.

Discussion.

Eosinophilic granuloma, Letterer-Siwe's disease and Hand-Schüller-Christian's disease are generally regarded as three forms of the same basic defect affecting the reticulo-endothelial system (Jaffe and Lichtenstein, 1940; Topouzian *et alii*, 1958; Wallenborn, 1959) and collectively called histiocytosis X. Goodhill (1950) has observed all three manifestations in the one patient.

Eosinophilic granuloma may be regarded as the subacute form, although rarely it may be observed as a relatively acute or chronic lesion. It is almost invariably benign and may retrogress and disappear spontaneously. The lesion itself is of a destructive, rather specialized, inflammatory type, charaterized by a localized or generalized response of the reticulo-endothelial system. In many cases there is a mild eosinophilia of the blood, varying between 4% and 10%, and there may be an associated anæmia. No other constant abnormality of the blood has been found

[1] For Figures I to V see art-paper supplement.

and the response to the urinary test for Bence-Jones protein is consistently negative.

Letterer-Siwe's disease is an acute form of histiocytosis X which occurs in young children and infants. It is rare over the age of two years, and is a generalized systemic disease with fever, skin rash, lymphadenopathy and hepatosplenomegaly. The clinical course is fulminating and the outcome invariably fatal. Multiple irregular osteolytic skull lesions may be observed.

The Hand-Schüller-Christian form is usually a chronic disease occurring in adult life. However, in children it frequently manifests a rapid and fatal course. The characteristic clinical triad consists of osteolytic, usually multiple, skull lesions, unilateral or bilateral exophthalmos and diabetes insipidus. Visceral involvement is not uncommon and pulmonary fibrosis is an occasional finding. The mortality of this form of histiocytosis X is approximately 30% (Mistry, 1957).

Macroscopically the lesion of eosinophilic granuloma of bone is pale pink to dark red in colour, friable, often vascular and soft or firm in consistency depending on the relative degree of bone destruction, cellular infiltration and connective time reaction. There are large numbers of eosinophils and histiocytes, few lymphocytes and plasma cells and areas of necrosis and hæmorrhage. Cholesterol crystals surrounded by foreign-body giant cells are often present. As the lesion progresses the histiocytes take up lipoid material and become the characteristic foam cells. They increase in number at the expense of the eosinophils, which gradually disappear. In the final stages the self-limiting nature of the lesion becomes apparent histologically with the appearance of marked fibrosis, calcification and ossification. The acquisition of lipoid occurs late in both Hand-Schüller-Christian's disease and Letterer-Siwe's disease, whereas it tends to occur early in the course of eosinophilic granuloma (Boyd, 1955). The lesion of eosinophilic granuloma usually begins in the medulla of the bone and may extend through the outer or inner table, though usually both tables are involved in the later stages.

Skull involvement is usually manifested by local pain and tenderness, which diminish in severity as the disease progresses. Systemic manifestations are exceptional. Many cases are discovered accidentally following X-ray examination for other reasons, particularly trauma. Eosinophilic granuloma of the temporal bone presents a special diagnostic problem. It is usually associated with pain in and around the ear and a sero-sanguinous aural discharge (De Sa, 1959). The presence of granulation tissue in the external auditory canal may closely simulate both a cholesteatoma and a chemodectoma requiring a biopsy for differentiation. It is important to remember the tendency of the latter lesion to bleed profusely during such a procedure.

The radiological appearance of the skull lesion of eosinophilic granuloma is usually described as osteolytic with a rounded or geographical outline. The presence of a punched-out lesion with a sclerotic margin is indistinguishable from that of an epidermoid. The lesion may appear polycystic, as in one of the present cases, and both tables are usually involved (Knighton *et alii*, 1956). Other conditions which may have a similar appearance include metastatic or primary malignant tumours, myeloma, osteomyelitis, tuberculosis, other granulomata, Paget's disease, bone cysts, epidermoids, Hodgkin's disease and leukæmia.

As previously mentioned, the prognosis is almost invariably favourable. Few complications have been reported. However, trauma to the weakened area may lead to the development of fractures. Infection may occur if the lesion finds its way to the surface, as may occur with temporal bone involvement. Very large lesions of the skull behave essentially as vascular tumours and surgical removal may be technically difficult, because of the risk of hæmorrhage or because of sinus relationships. The removal of one huge biparietal lesion reported by Swain and Williams (1953) resulted in exsanguination of the patient during surgery. Lesions in bones elsewhere may result in pathological fractures which may be the presenting manifestation of the disease.

The ætiology of histiocytosis X in general, or of eosinophilic granuloma in particular, is not known. It has been considered an atypical form of tuberculosis, a disturbance of lipoid metabolism, of non-specific inflammatory origin or infectious, most probably viral. The observation that trauma frequently preceded eosinophilic granuloma (Otani and Ehrlich, 1940) is almost certainly coincidental, since an X-ray film taken soon after the trauma will usually reveal the lesion to be well established (Case I).

Before discussing treatment it is important to consider the opinion expressed by Copeland (1950), who stated that spontaneous healing is rare despite the concept that it is a self-limiting disease. Biopsy is essential to establish the diagnosis even in the presence of an eosinophilia in the blood. The lesion may be removed by simple curettage or left *in situ* after biopsy and treated by irradiation. Up to 1600*r* units may be given in six divided doses at daily intervals. Good results have followed a dose as small as 400*r*. After a complete curettage post-operative irradiation does not appear to be necessary (Campbell and Alexander, 1944). The entire lesion, including a margin of surrounding healthy bone, may be removed as a flap and the defect covered by a plastic prosthesis. More recently, after the experimental work of Rosenthal *et alii* (1950), who demonstrated the effect of the steroids in depressing the number of circulating eosinophils, these preparations have been used in the treatment of eosinophilic granuloma (Mistry, 1957; Wallenborn, 1959).

It is perhaps wise to commence a blood transfusion before large lesions are exposed and in such cases a pre-operative arteriogram is desirable to visualize possible venous connexions.

Since it is not possible to be absolutely certain that the skull defect is the result of a benign lesion, even in the presence of known previously biopsied lesions elsewhere in the body, a therapeutic trial with cortisone or irradiation during radiological control is not justified.

After therapy the patient should be controlled by periodic medical and radiological examinations.

Summary.

Two cases of eosinophilic granuloma of the skull occurring in young males are reported and the diagnostic and therapeutic considerations of the lesion are discussed.

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Reviews.

The Author-Publisher-Printer Complex. By Robert S. Gill; third edition; 1958. Baltimore: The Williams and Wilkins Company. 7¼" × 4¾", pp. 146. Price: 24s. 9d.

No book designed to guide prospective authors in the mysteries of writing and publishing will satisfy everyone in detail. Every publishing house has its own ideas on certain things. For all that, this book contains a great deal of useful information that will be generally acceptable. It is thoroughly readable, and tells the author most of what he wants to know as well as a good deal more that he ought to know. It will serve him very well, so long as he realizes that the publication or publishing house to which he intends to submit his material also has ideas of its own which need to be studied. It primarily applies to the publication of books more than to articles in journals, but a great deal of it applies to both.

Psychiatry in the Medical Specialties. By Flanders Dunbar, M.D., Med.Sc.D., Ph.D. New York, Toronto, London: McGraw-Hill Book Co. Inc.; 1959. Pp. 535. Price not stated.

FLANDERS DUNBAR has for many years presented the psychosomatic concept of illness, and this latest book of hers presents the psychiatric viewpoint of many physical illnesses commonly seen by the consulting specialist. The reader is carefully prepared in the opening sections by an orientation of disease, which includes both psychological and physical components and disposes of the old "either-or" concept of causation of illnesses. The author pleads for the careful assessment of all those forces which disturb human equilibrium at any one moment resulting in a state of disease. Dr. Dunbar abandons the notion that cause and effect are links in a single chain, and favours the concept of multiple causality. As a psychiatrist she devotes much attention to biochemical, epidemiological, hormonal and neuroanatomical factors in disease, as well as to emotional factors. Since Dr. Dunbar covers a great number of diseases in her argument, the non-psychiatric factors in each case are capably and impressively presented.

The range of maladies discussed is indeed large, ranging from most of the circulatory and gastro-intestinal disorders to those which would interest the ophthalmologist, the dermatologist, the geriatrician and the allergist. The question of accident proneness, and even cancer and tuberculosis are assessed from the point of view of emotional factors.

The cover is so great that this book must surely only act as a stimulus to a non-psychiatric medical specialist to read more intensively of the psychosomatic research done in his particular field. The whole field is covered in about 250 pages, so that the individual specialist may be disappointed in the amount of space devoted to his specialty. However, he is well instructed in the first 60 pages, in which the psychosomatic concept is presented in general terms, and in a further 60 pages on therapy.

As with Flanders Dunbar's earlier work on psychosomatic medicine, there is ample reference to special work done in each field of medicine. Whilst this is useful, the copious quotation of other opinion tends to disturb the continuity of the argument and leaves too little space for the reader to learn exactly what Dr. Dunbar thinks.

The section dealing with psychotic and psychoneurotic disorders occupies less than 60 pages; it is scarcely adequate for the general physician, and presents little new material for the psychiatrist.

The approach in general follows psychodynamic lines, and some psychiatrically unsophisticated Australian physicians might find the principles of therapy, however sound, a little difficult to understand. We were able to find 11 lines in all in the book dealing with the use of electroshock. This is an easy book to read, copiously illustrated with interesting case histories presented in a warm, flexible style. The medical specialist who needs to increase his understanding of total medicine should read it as a preliminary to a more detailed study of his own particular interest.

Ciba Foundation Symposium Jointly with the International Union of Biological Sciences on Biochemistry of Human Genetics. Edited by G. E. W. Wolstenholme, O.B.E., M.A., M.B., M.R.C.P., and Cecilia M. O'Connor, B.Sc.; 1959. London: J. & A. Churchill Ltd. 8" × 5¼", pp. 360, with illustrations. Price: 50s.

MANY VOLUMES recording the symposia of the Ciba Foundation have appeared during the ten years of its existence, and together they represent a most significant contribution to the scientific literature of the period. With respect to the present volume, we can do no more than echo the words of Dr. Neel, who opened the concluding discussion by saying: "I cannot recall attending any other meeting in recent years with such a high content of new material." This material is faithfully recorded, with a transcript of all the discussion, in the present publication. There is an especially valuable synthesis of new ideas and attitudes in several fields—genetics, biochemistry, practical medicine—whose individual workers have, normally, little opportunity to meet together.

In an introductory paper, the problems and advantages of using man as the object of genetical analysis are presented. There follow discussions of the genetical aspects of several diseases, including galactosæmia, blood cholinesterase variants, sensory perceptive disturbances and primaquine sensitivity of the red cell. The enzymatic defects are the prime consideration in these four papers; then we have several more detailed presentations of the basic chemical alterations, at the molecular level, in the different human hæmoglobins, the plasma protein variants, the various haptoglobins and transferrins, the blood-group substances and the gamma-globulin groups. In conditions still so incompletely characterized as these, the informal discussion following the papers is particularly informative. After a panel discussion on the topic of the tissue-culture approach (in which the difficulties are all clearly brought out), the symposium concludes with a most stimulating paper on the mechanism of gene action, which summarizes ideas obtained from many sources.

The volume is printed with the usual care and attention to detail that we have come to associate with the series, which is all the more praiseworthy in view of the promptness of its appearance.

Fundamental Aspects of Normal and Malignant Growth. Edited by Wiktor W. Nowinski; 1960. Amsterdam, London, New York and Princeton: Elsevier Publishing Company; London: D. Van Nostrand Company Ltd. 9½" × 6½", pp. 1042. Price: £10 10s. (English).

THIS book attacks the question of growth most enthusiastically. Various facets of this subject are dealt with by different authors, and the presentation is of a high order. As is stated in the preface, the size of the book allows only of some problems being included, since a complete survey would require several volumes. This being so, there will naturally not be complete agreement as to whether all the most suitable subjects were chosen.

The plan is a presentation of various aspects of the biochemistry of relevant substances, systems and cell components; the principles of growth, various embryonic processes such as induction, regeneration, special problems occurring in tissue culture, wound healing and cancer. There is a chapter on plant growth.

The various parts have been done well in that, in addition to the large amount of information presented, there is much thought-provoking discussion of matters directly involved in or others indirectly related to the subject in hand. Many propositions, necessarily introduced, will be found entertainingly reviewed. These include the kinetics of open systems, growth and evolution, cell constancy, significance of nerve supply, growth and aging, the relation

of growth to differentiation and very many others. Each reader will find his own special interests. In appropriate places useful definitions are given.

The biochemical sections are specially comprehensive and will be invaluable to workers entering this field. Individual sections may be of doubtful value to the specialist, but are suitable for the well-informed biologist. The cancer section is the most limited in scope, but provides an excellent survey of some aspects of recent work. In view of the colossal amount of new work appearing, the contributors have given a good review. The main criticism is of the implication in places that growth is a new concept and merely one of the phenomena exhibited by living tissue. However, its fundamental biological importance is emphasized in most parts.

There is good integration of different chapters, and a sound basic approach has been achieved. The subjects are comprehensively reviewed, and an excellent bibliography in each section should provide a valuable, balanced reference source.

The work can be thoroughly recommended, not only to those interested in the specific problems, but also to all working on basic questions in pathology and medicine.

Surgery of the Acute Abdomen. By John A. Shepherd, V.R.D., M.D., Ch.M.(St. And.), F.R.C.S. Ed., F.R.C.S. Eng., Q.J.S.; 1960. Edinburgh and London: E. & S. Livingstone Ltd. 9¾" × 6", pp. 1240, with illustrations. Price: £5 net. (English).

THIS book commences its career most auspiciously with the blessing of Sir Zachary Cope, that doyen of abdominal surgeons, whose classical monograph on "The Early Diagnosis of the Acute Abdomen" has set a world-wide standard through 11 editions for the past 40 years. We consider that Shepherd's book has attained, if not surpassed, this standard.

Chapter 1 discusses principles and method of diagnosis in great detail. However, we consider that too much emphasis is placed on the "diagnostic aspiration" or "tap" in the diagnosis of the "acute abdomen". After reading this section, one would be interested to know what Mr. Shepherd actually thinks of this procedure, in addition to the views of the various authorities mentioned in this regard.

"Principles of Management" occupy Chapter 2, and there the author rightly points out that major abdominal procedures presenting in emergency should not be entrusted to surgical trainees unless properly supervised by experienced senior surgeons. At the same time, too, he advocates anæsthesia by experienced, skilful anæsthetists, as well as operating theatre assistance by an experienced nursing staff.

In the discusion on resuscitation, the giving of serum albumin is not mentioned; no doubt this will take the place of serum and dextran in later editions.

In relation to operative technique, direct decompression of distended small and even large intestine by the use of a wide-bore needle is discussed, but no mention is made of the danger of subsequent peritonitis. Its place in these days of modern relaxation anæsthesia must be very limited indeed.

In the section on post-operative complications, it is indeed refreshing to find that the author agrees that wound dehiscence may occur whether absorbable or non-absorbable sutures are used and whatever the technique of their insertion.

In Chapter 3, and again in Chapter 10 (page 455), an excellent discussion of the pros and cons of peritoneal drainage is presented, throwing a good deal of light on this debatable subject.

Each organ is then allotted a chapter, and its acute surgical diseases and also rupture from both external and internal injury are described. Each chapter is followed by a selection of references, mainly from British and American sources. The author states in the preface that a similar survey from the literature of other countries was a task too onerous to undertake.

The author rightly points out that there is a definite place in many cases of acute fulminating pancreatitis for operative treatment when allied with intelligent electrolyte, fluid and blood replacement. Laparotomy enables one to remove and drain away peritoneal exudate containing a high concentration of tissue-damaging enzymes. This drainage also helps relieve pain, which may not occur with non-operative treatment.

Hæmobilia is not mentioned as a cause of acute gastro-intestinal hæmorrhage, though this is finding increasing mention in world literature. It is strange to Australians' eyes to find no reference to hydatid disease, as it is of world-wide distribution and is well known to cause sudden abdominal emergencies. As this book is obviously intended for world-wide reading, a chapter on acute abdominal surgery in tropical countries would be well worth adding.

An appendix of the author's personal experience in the acute surgery of the abdomen concludes the book, which is produced at the high standard one always finds in Livingstone's productions. Many good illustrations are furnished, including excellent radiographs from the author's practice. In all, it is a good book, especially so for the young surgeon, and even for the more experienced man accustomed to dealing with the surgery of the acute abdominal emergency.

Aphasie-Therapie. By Miklós Vargha and György Geréb; 1959. Jena: Veb Gustav Fischer Verlag. Sydney: Angus & Robertson, Limited. 8½" × 5", pp. 46. Price: DM 6.85. DM-6.85.

IN another book in the same series "Aphasie-Therapie", Dr. Miklós Vargha and Dr. György Geréb present their method based on the motor or nominal aphasic's common ability to sing a familiar song or even to speak under the impulse of emotion. The patient listens to nursery songs while appropriate illustrations are presented to him, and he is encouraged to name some of the details. After some success the illustrations are shown in different order. With further progress the aphasic may frame simple sentences, and at a later stage two or three patients are set to question each other about the illustrations. The method is modified for sensory aphasics provided that they can read.

The authors claim considerable success with the majority of their patients, mostly arteriosclerotics with motor aphasia who had shown no spontaneous improvement after several months. A detailed account of the treatment of a patient, with the music and illustrations which were used, is given at the end of the book.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"The Person Symbol in Clinical Medicine: A Correlation of Picture Drawings with Structural Lesions of the Brain", by Robert Cohn, M.D.; 1961. Springfield, Illinois: Charles C. Thomas; Oxford: Blackwell Scientific Publications Ltd. 10" × 6½", pp. 212, with illustrations. Price: 80s. (English).

"Planning of Public Health Services: Fourth Report of the Expert Committee on Public Health Administration", World Health Organization Technical Report Series, No. 215, 1961. Geneva: World Health Organization. 9½" × 6¼", pp. 48. Price: 3s. 6d.

"Recommended Requirements for Schools of Public Health: Tenth Report of the Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel", World Health Organization Technical Report Series, No. 216; 1961. Geneva: World Health Organization. 9½" × 6¼", pp. 24. Price: 1s. 9d.

"Cardiovascular Abstracts: 1, 1960, selected from World Literature", edited by Stanford Wessler, M.D.; 1961. New York: The American Heart Association, Inc. 10" × 7½", pp. 192. Price not stated.

"Symposium on Coronary Heart Disease", No. 2, edited by Herrman L. Blumgart, M.D.; 1961. New York: The American Heart Association, Inc. 10¼" × 7½", pp. 156. Price not stated.

"Atlas of Obstetric Technic", by J. Robert Willson, M.D., M.S.; 1961. St. Louis: The C. V. Mosby Company. Melbourne: W. Ramsay (Surgical) Ltd. 10¾" × 8¼", pp. 304, with many illustrations. Price: £7 19s. 6d.

"Surgical Diseases of the Chest", edited by Brian Blades, M.D.; 1961. St. Louis: The C. V. Mosby Company. Melbourne: W. Ramsay (Surgical) Ltd. 9¾" × 6¾", pp. 580, with 267 illustrations. Price: £12 2s.

"How to Relax and Have Your Baby: Scientific Relaxation in Childbirth", by Edmund Jacobsen, M.D.; 1959. New York, Toronto, London: McGraw-Hill Book Company Inc. 8" × 5¼", pp. 210, with illustrations. Price: $3.95.

"Cardiac Problems: Papers Read at Three Symposia"; 1961. London: The Chest and Heart Association. 7¾" × 4¾", pp. 144, with illustrations. Price: 18s. 6d., or $3.50.

The Medical Journal of Australia

SATURDAY, JULY 22, 1961.

THE MERVYN ARCHDALL MEDICAL MONOGRAPH FUND.

AN important letter from Dr. H. C. Colville, President of the Federal Council of the British Medical Association, appears in the Correspondence Columns of this issue (see page 157). It draws attention to the Mervyn Archdall Medical Monograph Fund and to the need of further support for the fund. We hope that it will be heeded and that many members of the B.M.A. will give generously and cheerfully to ensure the continued usefulness of this fund.

The Federal Council made a happy decision last year when it gave its medical monograph fund a new name—the Mervyn Archdall Medical Monograph Fund. It was not only a fitting way of perpetuating the name of a man who had devoted his life to encouraging the development of medicine and medical research in Australia, especially from the publication point of view; it also recognized the fact that this was very much Dr. Mervyn Archdall's fund. He thought of the idea, he presented it to the Federal Council and had it approved, he infused others with enthusiasm about it, and his personal representations to his colleagues produced a substantial proportion of the donations that started it off. The idea of the fund rested on three points: it was desirable to publish worthwhile Australian work in Australia; it was not practicable to publish in journals the lengthy papers that are the necessary outcome of certain types of investigation; individual authors and even research institutes could not always meet the considerable cost involved in the publication of a monograph. The Federal Council accepted the significance of these points when Dr. Archdall presented them and, recognizing the responsibility of the B.M.A. to the scientific aspects of medicine, established the fund. By adopting the following report[1] of a subcommittee which it had set up it determined the nature and mode of operation of the fund:

1. That the fund be known as the Federal Council Medical Monograph Fund.

2. That the object of the fund shall be the publication of monographs of a high standard on the medical and allied sciences on behalf of authors who are unable to bear the cost of publication.

3. That each monograph shall be inscribed "Medical Monograph of the Federal Council of the British Medical Association in Australia, Number X".

4. That the Federal Council shall appoint three trustees to administer the fund.

5. That the trustees shall have powers of cooption for special purposes.

6. That monographs submitted for consideration be scrutinized by the trustees and the Editor of THE MEDICAL JOURNAL OF AUSTRALIA, and that they shall determine whether the advice of special referees is necessary.

7. That as a general rule not more than two referees be selected to advise the trustees.

8. That the referees shall preferably have had no association with the work presented in the monographs.

9. That the referees be paid an honorarium, the amount of which shall be determined by the trustees.

10. That the monographs shall be edited and published by the Australasian Medical Publishing Company Limited (no charge shall be made by the company for the editing).

11. That the presentation of the copy for the monographs shall in general be that required for THE MEDICAL JOURNAL OF AUSTRALIA.

12. That the proceeds of the sales of the monographs be paid into the fund unless otherwise determined by the trustees.

13. That in the foregoing clause the question of payment of a royalty to the author shall not be lost sight of.

14. That steps be taken to secure contributions to the fund.

Since the establishment of the fund a number of manuscripts have been submitted for consideration. Only two have been accepted, and subsequently published. Monograph No. 1 is Bryan Gandevia's "An Annotated Bibliography of the History of Medicine in Australia", a first-class piece of work of permanent value, for which there should be a steady if small demand for many years to come. Monograph No. 2 is Peter Hall's "Gynæcomastia", a comprehensive and original study which has received uniformly favourable reviews in various parts of the world, but has rather inexplicably not sold well. Both these monographs justified publication, but neither has been a money-spinner, and the Monograph Fund has consequently not been reimbursed to the extent that might have been hoped, even though no one expected that such a fund would be particularly profitable.

The amount standing to the credit of the Monograph Fund according to the report presented at the meeting of the Federal Council in March of this year was £2486, most of which had been invested. This is not a large sum in terms of modern publishing costs and could quickly disappear if the *corpus* of the fund had to be called upon, as it is intended that it should be if necessary. The Federal Council wisely considers that it should be supplemented and appeals confidently for further donations. These should be sent to the Trustees, c.o. the Federal Council of the B.M.A. in Australia, 135 Macquarie Street, Sydney. All donations will be acknowledged in the columns of this journal. We hope for a generous response. When the fund was launched in 1954 a leading article on the subject[2] concluded: "Donations to the fund are invited

[1] MED. J. AUST., 1953, 2: 938 (December 19).

[2] *Ibid.*, 1954, 1: 291 (February 20).

from Branches of the Association, from the members of the Branches, from scientific, non-medical organizations and from scientifically minded members of the community." The appeal to all these groups is still valid. To them we would add the friends and admirers of the late Dr. Mervyn Archdall and all who, though they may not have known him in the flesh, realize that they are in his debt because of his service to medicine in Australia.

Comments and Abstracts.

THE HISTORY OF THE MOORFIELDS MEDICAL SCHOOL.

EVEN those practitioners of medicine whose specialty is not that of ophthalmology are familiar with the name "Moorfields"; like "Bart's", "Guy's", and a number of others, it carries an aura of antiquity and activity, a telling mixture. To mark the occasion of the 150th anniversary of the foundation of the Moorfields Medical School, Charles Cook[1] read a paper at Moorfields to tell its story.

The idea of the establishment of a hospital entirely for the treatment of and instruction in diseases of the eye in the early nineteenth century stemmed from the great increase in ocular diseases that followed the Napoleonic War. "Egyptian ophthalmia" swept through the English troops defending Egypt; they were evacuated and disbanded in 1803, and the disease spread rapidly throughout Great Britain. (Cook states that it was almost certainly trachoma complicated by other infections.) Until then, ophthalmology had been a veritable Cinderella of medicine, being largely in the hands of itinerant quacks, some of whom had colourful remedies and equally colourful careers. The natural outcome was that respectable medical practitioners were reluctant to have anything to do with teaching or practising the subject. The change in the situation was given impetus by a young surgeon, John Cunningham Saunders, who was advised and encouraged by his patron, Astley Cooper, to start a special institution for the treatment of the eye and ear. (He was not the very first in London—that place belongs to a Dr. Wathan and a Dr. Ware, who had started such a hospital in Cork Street in 1804.) Saunders, after obtaining the approval of the physicians and surgeons of St. Thomas's Hospital and Guy's Hospital, on October 1, 1804, published a proposal for opening a dispensary for the poor suffering from diseases of the eye and ear. A committee was formed, subscriptions were obtained, and on March 25, 1805, the London Dispensary for Curing Diseases of the Eyes and Ears was opened for the reception of patients at 40 Charterhouse Street. During the first year 600 patients were admitted, with 500 reputed cures, and by the fourth year the numbers had risen to 2357, with 1970 reputed cures. Cook points out that the word "cure" must be taken in its widest sense; cases of complete corneal opacity were included, so that although the treatment might have been successful, the patient remained blind. In December, 1807, at Saunders's request, the governors agreed that the charity should be limited to diseases of the eye, and the name of the hospital was changed to the London Infirmary for Curing Diseases of the Eye. The reason? ". . . apart from the removal of inspissated wax from the external ear, there was not any useful treatment for deafness."

By 1809 Saunders had two pupils working with him; both later became ophthalmic surgeons. They were William Adams, who founded the West of England Eye Infirmary at Exeter and became oculist to the Prince Regent, and John Stevenson, who founded the Royal Infirmary for Cataract and Other Diseases of the Eye in London in 1830 under the patronage of King William IV, to whom he was appointed oculist. This hospital survived for only 14 years. After Saunders's untimely death in 1810, Astley Cooper took over the care of the out-patient and in-patient departments until the appointment of Benjamin Travers to fill the vacancy. Travers, who was a general surgeon, was able through his connexion with St. Thomas's Hospital to bring his students to the Eye Infirmary for special instruction; in 1810, at his instigation, the practice of the Infirmary was opened to medical students. In the annual report for that year it was noted that medical officers had been given permission to deliver lectures, and that the attention of the Committee had been occupied with the means of extending the immediate circle of operation of the institution; their intention was that "a knowledge of the diseases of the eye shall be more generally diffused among the members of the medical profession".

This was the birth of the school of ophthalmology. Students soon came from other countries, trained and returned home to found similar institutions. In the seventeenth year of its operation, the school had trained over 1000 students from every part of the world; according to the annual report of the hospital, they "had diffused the hospital's benefits over various remote parts of the globe so that it is perhaps as well known on the banks of the Ganges as on the banks of the Thames". Financial support at this time came chiefly from subscriptions and donations received at the anniversary dinners. By 1819 sufficient funds were in hand to permit the appointment of a building committee, and on May 2, 1821, the foundation stone of a new infirmary was laid in Moorfields (a piece of moorland to the north of the old City Wall); it was a well-known place of recreation. At this time the name of the institution was changed to the London Ophthalmic Infirmary, but it soon became known as Moorfields Eye Hospital. On November 12, 1822, an introductory lecture announcing the arrangement of a course of instruction was given by Dr. Farre, who was thus the first to set up a scheme of instruction for students; he also laid stress on the relating of clinical signs and symptoms to the pathological findings. On the death in 1827 of the Duke of York, the infirmary's first patron, the patronesses became the Duchess of Kent and her daughter the Princess Victoria; the Board of Governors thereupon changed the name of the institution to the Royal London Ophthalmic Hospital, Moorfields. After the accession to the throne of the Princess Victoria, her patronage continued all through her reign. The hospital continued to expand in fame and scope, with great increases in the numbers of out-patients and in-patients. In 1841 it dealt with 5043 patients and in 1851 with 11,384. An interesting departure from custom was made in 1854. In order to help non-medical missionaries, the medical staff agreed to admit non-medical personnel to the practice of the hospital, provided that a missionary society vouched for the fact that they were about to proceed on missionary duties abroad. A large number of men and women were glad to accept this help.

In 1856, the medical board suggested that some of the younger doctors should be chosen to serve as assistants to the surgeons. Thus was begun an organized system of training, designed to send out from Moorfields fully trained ophthalmologists, who would be able to act as consultants in England and many other countries. This clinical teaching was augmented in 1859 by a three-months' course of lectures in ophthalmic surgery given by Sir George Critchett and Sir William Bowman. Students who attended these lectures were able to comply with the rules of the Royal College of Surgeons of England and obtain a certificate of proficiency. In 1864, evening ophthalmoscopic demonstrations conducted in turn by different members of the staff were begun for students.

In 1899 the eye hospital was transferred from Moorfields to City Road. There were several reasons. The Moorfields area, from being quiet and secluded, had become one of the busiest in London. The constant increase in the number of patients had necessitated additions in 1870 and 1875, but these were insufficient and unsatisfactory. Moreover, the hospital was attracting students and trained ophthalmologists from all parts of the world. Therefore,

[1] *Brit. J. Ophthal.*, 1961, 45: 241 (April).

a lease was finally obtained for 999 years from March, 1894, of the City Road and Peerless Street site, and the new hospital was officially opened as the Royal London Ophthalmic Hospital on June 28, 1899, by the Duke and Duchess of York. A dean was appointed to supervise the classes and advise the students. In 1920 the Royal College of Physicians of London and the Royal College of Surgeons of England established a diploma in ophthalmology. This necessitated the institution at Moorfields of courses of instruction in optics and in the anatomy and physiology of the eye. Until then the teaching had been almost entirely clinical and pathological.

After the second World War the British Postgraduate Medical Federation was formed within the University of London, and the Moorfields medical school was invited to join the Federation as an Institute of Ophthalmology. As a desirable coordinating measure, and because of the tremendous building difficulties in post-war London, the Royal London Ophthalmic Hospital combined with the Central London Ophthalmic Hospital (founded in 1843) and later with the Royal Westminster Ophthalmic Hospital (founded in 1816); this combination was confirmed by Act of Parliament on January 1, 1947. As a result, the old Central London Ophthalmic Hospital in Bloomsbury was converted into a research and teaching institute, and the other two hospitals, in City Road and High Holborn, were united under the historical name of Moorfields Eye Hospital, to act as associated clinical units. In 1948 the Institute of Ophthalmology was formally incorporated into the University of London as its post-graduate school of ophthalmology.

Cook's paper is followed by an interesting account of "Some of the Great Historical Figures Associated with Moorfields", by T. K. Lyle.[1] As an appendix to our abbreviated account of the history of the medical school, a simple list of these names may not come amiss. It is as follows: John Cunningham Saunders, hospital staff, 1805 to 1810; Sir Astley Cooper, Bart., F.R.S.; John Richard Farre, hospital staff, 1805 to 1857; Richard Battley, hospital staff, 1805 to 1818; Benjamin Travers, F.R.S., hospital staff, 1810 to 1817; Sir William Lawrence, Bart., F.R.S., hospital staff, 1814 to 1826; Frederick Tyrrell, hospital staff, 1817 to 1943; Sir William Bowman, Bart., F.R.S., hospital staff, 1846 to 1876; Sir Jonathan Hutchinson, F.R.S., hospital staff, 1862 to 1878; Hughlings Jackson, F.R.S., an early clinical assistant; George James Guthrie, hospital staff, 1816 to 1856.

[1] *Brit. J. Ophthal.*, 1961, 45: 251 (April).

PASCAL'S "PENSÉES".

BLAISE PASCAL, mathematical genius of the seventeenth century, gave us the scientific proof of the existence of the vacuum; he measured the variation caused by altitude in atmospheric pressure; he formulated the law of equal pressure in a fluid; he planned the first public 'bus company and devised the first wrist watch; but the most pressing and absorbing pursuit of his life was his endeavour to reconcile his need for religious faith with his intellectual disbelief. His "*Pensées*", or "thoughts", have relevance in the modern world. Written as they were against the background of a France torn by religious dissent, intrigue and political compromise, in which old standards were falling under a battery of national thinking, they represent the struggle of a man to uphold and justify his belief in God in the face of his reasonable doubts. They have pertinence today, when things infinitely large and things infinitely small persuade us of the absurdity of our conceit in believing in the dignity and divinity of men. Originally conceived merely as notes, to be expanded into a major work entitled "An Apology for the Christian Religion" (which was never written), few of the *Pensées* are followed through; many remain as jottings exactly as they first appeared, scribbled along the edges of pages already full. They are addressed to an imaginary unbeliever (supposed by many to have been Cyrano de Bergerac) and seek to persuade him, sometimes rationally, sometimes passionately, of the validity of the Christian faith.

Penguin Books have now produced a new translation of the "*Pensées*" by a modern scholar, who wisely refrains from interpreting or explaining too much.[1] We are given a few fascinating details of Pascal's medical history. His fierce headaches and premature death at the age of 39 are attributed to a failure of union of "one of the sutures" of the skull, with consequent overlapping of bones and the creation of a bony ridge. His two-hour vision on the night of November 23, 1654, and the strange disjointed account of it which he wrote on parchment and wore about his neck for the rest of his life, open up for speculation the question of his complete sanity. Our debt to him, at all events, even discounting the entertainment or enlightenment we may derive from his "*Pensées*", is a great one; how impotent would our profession be had he not given us our first syringe?

[1] "The Pensées", by Blaise Pascal, translated with an introduction by J. M. Cohen; 1961. Middlesex, Baltimore, Victoria: Penguin Books Pty. Ltd. 7¼" × 5¼", pp. 288. Price: 5s. 6d.

CHANGING PATTERNS IN BRITISH FOOD HABITS.

A SURVEY completed recently by Dorothy Hallingsworth of the Food Science Division of the Ministry of Agriculture in Great Britain, of the changing patterns of food consumption in that country since the 1939-1945 war, indicates an over-all improvement in the nutritional value of the national diet. The supplies of dairy products (excluding butter), meat, poultry, fruit and vegetables are all higher than before the war, while the butter supplies are increasing and approaching pre-war levels. Individual dietary elements such as calcium, iron and vitamins are consumed in greater quantities, and this is so for almost all essential constituents.

Most of the major post-war dietary improvements had been made by 1947, a year of rationing and shortage. Since the lifting of control the supply (and hence the consumption) of several of these elements (protein, calcium, vitamin C and vitamin B complex) has either remained stationary or fallen slightly. That is to say, palatability and variety in the national diet have been achieved in the years of plenty and of free choice without a corresponding rise in nutritional value.

It further emerges from this survey that of the 66% increase in calcium consumption which took place by 1947 (that is, compared with the pre-war level) one-third was due to increased milk supplies and the other two-thirds to the addition of *creta preparata* to flour. The consumption of thiamine stood in 1947 at 38% above the pre-war level, and this was due largely to the restoration of this vitamin to flour. Similar conditions were true for nicotinic acid and iron. Vitamin A had been added to margarine, which accounted for its increased consumption.

Dorothy Hollingsworth considers that changes in the nutritional value of the national diet are more likely to be brought about by the actions of food manufacturers and government bodies than by the educated choice of the individual. This seems to be borne out by the slight falling off in national nutrition in Great Britain since control was lifted. We in this country should bear this in mind perhaps in relation to some of our own food problems. One of these is the question of the fluoridation of water. Until the Government orders fluoridation of water supplies, it is unrealistic to suppose that an educated public will safeguard its teeth by buying and sucking fluoride tablets. Another problem is the high fat content of our diet and the relationship between saturated dietary fat, serum cholesterol levels and coronary heart disease. Public education literature, no matter how persuasive or ubiquitous, will probably never achieve a change in the national diet until such foodstuffs as margarine are certified to contain less saturated fat than butter and until

[1] *Proc. Nutrition Soc.*, 1961, 20: 25.

vegetable cooking oils are available at prices comparable with that of beef fat.

THORACIC TRANSPOSITION OF THE SPLEEN FOR PORTAL DECOMPRESSION.

MORE than once a chance observation has led to successful clinical application. An example is reported by John H. Foster and others[1] in the treatment of portal hypertension. In 1955 two Finnish surgeons, Nylander and Turunen[2] treated three patients with portal hypertension by transposing the spleen into the left pleural cavity. The results were satisfactory. These surgeons were led to try this operation after treating a patient with traumatic rupture of the diaphragm and displacement of the spleen into the left side of the chest. Venous collaterals between the spleen and thoracic wall were so extensive that it was not possible to replace the spleen in the abdomen, and the spleen was removed. The venous collaterals were so large that they thought such anastomoses might be useful in the treatment of portal hypertension, and the clinical results supported this view. Some experimental work has already tended to confirm these findings, and Foster and his colleagues describe in detail another series of experiments on dogs. They state that "the experimental observations made to date indicate that thoracic transposition of the spleen is an effective method of decompression of an obstructed portal system. The procedure results in prompt formation of extensive splenothoracic collaterals". Ligation of the portal vein is always fatal in the normal dog, but in dogs with transposed spleens 27% survived acute ligation of the portal vein. "The procedure seems particularly well adapted to the patient with portal hypertension and hæmorrhage from œsophageal varices in whom a portal-systemic venous shunt is not feasible or possible. Further experimental and clinical studies are clearly needed."

SHORTER ABSTRACTS.

PÆDIATRICS.

EFFECT OF SPLENECTOMY IN THALASSÆMIA. J. Wolff *et alii*, *Pediatrics*, October, 1960.

THE indications for splenectomy in Mediterranean anæmia are stated to be an increasing need for transfusions or other evidence suggestive of hyperplenism, or such massive splenomegaly as might predispose to traumatic rupture. Eighteen children who were submitted to splenectomy required fewer transfusions and maintained higher hæmoglobin levels subsequently, for varying periods of time. Of these 18 patients, seven have died, all but two of these developing chronic congestive heart failure late in the course of the disease. Pericarditis was suspected in life and proved at necropsy in three subjects. No definite proof of the relationship of splenectomy to the incidence of pericarditis was shown. No significantly increased incidence of severe infection was observed post-operatively.

"ENCLOSED" HÆMORRHAGE AND NEONATAL JAUNDICE. A. R. Rausen and L. K. Diamond, *Amer. J. Dis. Child.*, February, 1961.

HYPERBILIRUBINÆMIA in the newborn, regardless of the cause, is a potentially dangerous state. If the serum indirect bilirubin level exceeds 20 mg. per 100 ml., the possibility of kernicterus is significant; the higher the bilirubin level, the greater the risk of central nervous system damage. Many factors, singly and in combination, predispose the newborn infant to the development of a transient hyperbilirubinæmia. It is now well established that the ability of the newborn liver to conjugate bilirubin and thus transform it to an excretable form is deficient to a variable degree for the first few days of life. This tendency is most marked in the premature infant, in whom effective conjugation may be deficient for over a week. The authors report three cases in which extensive hæmorrhage into the tissues of the newborn infant was associated with hyperbilirubinæmia of significant degree. Two of the infants were premature by weight. The third infant had transient neonatal thrombocytopenia. In no instance was the delivery excessively traumatic. Although marked anæmia was not evident in any of the infants, significant fall in hæmoglobin value from initially high levels did occur in the two cases in which serial observations were possible before exchange transfusion was performed. Exchange transfusion was successful in maintaining the serum indirect bilirubin level below 20 mg. per 100 ml. To date, none of the infants shows evidence of neurological damage. The presence of "enclosed" hæmorrhage in a newborn infant, regardless of the cause, should alert the physician to an increased risk of hyperbilirubinæmia. As in other hyperbilirubinæmic states, exchange transfusion is still the only effective method of dealing with such an excess bilirubin load, and of decreasing the concomitant risk of kernicterus.

THE CLINICAL COURSE AND TREATMENT OF 100 CASES OF STILL'S DISEASE. B. Schlesinger *et alii*, *Arch. Dis. Childh.*, February, 1961.

THE authors present a review of the clinical course and treatment in 100 cases of Still's disease. They confirm Still's original contention that the disorder in childhood often has its major impact on various sites of the body apart from the joints. In many children there may be a "systemic" stage followed by an "arthritic" stage, but in a number the disease can begin insidiously in the joints, as it usually does in adults. Some support is given to the conception that rheumatoid arthritis is only one of a group of collagen disorders by the association in certain instances of Still's disease and dermatomyositis in the same patient. The malady is more acute in children than in adults and yet the period of activity of the disease is often very much shorter. Treatment with steroids gives the best results if begun early. The duration of treatment required is much shorter in children than in adults. Osteoporosis with vertebral collapse is the most serious complication of steroid therapy. Although a few recalcitrant cases pursue a relentless course in spite of all forms of treatment, the authors consider that steroid therapy is justified in all but mild forms of the disease and is most likely to bring about complete recovery.

SLEEP PATTERNS IN INFANCY. A. H. Parmelee, *Acta Pædiat.*, (*Uppsala*), March, 1961.

THE author states that most parents and some doctors have the impression that infants several months old sleep much less than newborn or very young infants. The author presents a review and analysis of the sleep and wakefulness patterns of one boy from birth to 35 weeks of age. This boy's total sleeping time decreased gradually from 17·8 hours in the first week to 14·3 hours at 35 weeks. The most remarkable changes were in the increase in the duration of the sleep and waking periods. The average longest sleep period for the first week was 4·4 hours and for the twenty-ninth week 11·7 hours. The frequency of wakeful periods dropped from an average of 7·5 in the first week to 4·2 in the thirty-fifth week. A diurnal sleep pattern is apparent in the behaviour day charts from the sixth week onwards, and very definite after the twelfth week. The sleep patterns noted in this case are essentially the same as those reported in the literature cited. Essentially, all investigators have noted predominantly a lengthening of single sleep and wakeful periods with maturation in the first year, rather than a marked reduction in the total amount of sleeping time.

CLINICAL MANIFESTATIONS OF DUPLICATION OF THE BOWEL. R. W. P. Mellish and C. E. Koop, *Pediatrics*, March, 1961.

THE authors report 38 cases of duplication of the bowel. Duplications may arise at any point along the alimentary tract but are most frequent in the abdominal cavity. Heterotopia of the mucous membrane is often present. When acid secreting mucosa lines the lesion, hæmorrhage or erosion may result. Anatomically, duplications can be classified into spherical or tubular forms. The spherical seldom communicate with the normal bowel lumen, whereas the tubular may open into the intestine at some point. Other visceral anomalies are frequently associated. Vertebral

[1] *Surgery*, 1961, 49: 223 (February).
[2] *Ann. Surg.*, 1955, 142: 954 (December).

anomalies often are discovered with thoracic duplications. Diverse symptoms and signs may lead to the finding of a duplication. In this series respiratory difficulty predominated in five patients, abdominal pain in six patients, an abdominal or anal mass in seven patients, an acute abdominal problem in seven patients, and on ten occasions duplications were discovered when patients underwent investigations or operative procedures for other problems. Thirty-six of the 38 patients underwent surgical operation. Interference was deemed unnecessary in one patient. Among the 36 patients subjected to surgery, 35 survived and have had no subsequent difficulties.

ORTHOPÆDIC SURGERY.

INJURIES TO MEDIAL LIGAMENT OF THE ANKLE. O. S. Staples, *J. Bone Jt Surg.*, December, 1960.

THE author states that closed reduction and external splinting has been the traditional treatment for ruptures of the deltoid ligament of the ankle, but that recently several authors have recommended open suture of the deltoid ligament as a more satisfactory routine. He advocates open surgical treatment of such injuries only in special circumstances, and discusses his results with conservative treatment. He notes that solitary injury of the deltoid ligament of the ankle is rare. The ligament itself is complex and may be partially injured; more often there is a triad of rupture of the deltoid ligament, fracture of the distal end of the fibula, and rupture of the anterior capsule of the ankle joint, together with partial tearing of the tibio-fibular ligament complex. Open reduction of this is an unnecessarily complicated procedure in ordinary circumstances. The author states that his results with 83 patients treated conservatively confirm this. He emphasizes the importance of careful examination by the clinician, who should supervise the radiographer's examination. Poor stress radiographs are misleading. The author externally rotates the ankle and abducts it. He wears lead gloves to protect his hands. The patient often needs to be anæsthetized. Treatment requires a long leg plaster, the foot being held in internal rotation and adduction. This position must be maintained for three to five weeks. A further below-knee plaster with a lesser internal twist to the ankle is maintained for a further six to eight weeks. A walking cast is not ordinarily used. The patient is given usual follow-up physiotherapy. The author finds that complete reduction can be easily achieved; rarely, an interposed roll of ligament or a displaced posterior tibial tendon prevents closed reduction, and open operation becomes necessary. This paper was read at the 1960 annual meeting of the American Orthopædic Association, and the discussion is appended.

THE PROBLEM OF THE PRIMARY CURVE. J. R. Cobb, *J. Bone Jt Surg.*, December, 1960.

THE author states that scoliosis has always been one of the more difficult problems in orthopædics, and that, in his opinion, Ferguson's concept of a primary curve was the first great step in its solution. However, the author considers that this concept is poorly understood in the minds of many orthopædic surgeons, and he proceeds to explain why it should be no problem. The area of the spine changed by the deforming force is the primary curve. Changes in other parts of the spine which occur to compensate for the lean caused by the primary curve and to maintain the head erect over the pelvis can be called secondary curves. The author describes in detail the structural changes that can be seen in the antero-posterior radiograph of the primary curve. These structural changes are lateral wedging of the bodies, rotation of the bodies and abnormalities of position of the bodies. The author stresses the importance of searching for these changes in what appear to be compensatory or secondary curves, because there can be more than one primary curve. If this is so, then correction of the obvious primary curve may lead to worse general deformity. The article is illustrated with cases managed successfully by the author, to show what can be done for patients in whom the primary curve is of the order of 80° to 100°.

FRACTURE OF THE NECK OF THE FEMUR IN CHILDHOOD. A. McDougall, *J. Bone Jt Surg.*, February, 1961.

THE author considers 24 patients, all under 17 years of age, who suffered various fractures of the neck of the femur. The youngest was four years old. The results were less satisfactory than in adults; this disagrees with the views of other authorities. The author notes that in the past fractures of the neck of the femur in children have been commonly misdiagnosed. The results were then mistaken for destruction of the joint by tuberculous disease. This is illustrated by the description of the state of a hip joint in a man aged 60 years, who injured his hip when he was about nine years old. The incidence of this fracture in childhood is rare, but motor vehicle accidents are a cause. Union usually occurs, but coxa vara often develops with shortening of the limb and gross deformity of the hip joint. In the author's series, avascular changes were common, and he relates this to the poor anastomosis of the ligamentum teres vessel with the branches of the retinacular vessels in the head. Even basal and intertrochanteric fractures can lead to this change. The avascular head can unite to the shaft, but this occurs slowly, as it becomes revascularized; early weight bearing would produce changes which have been called Perthes changes by well known authorities. The avascular head is not painful; pain comes with revascularization. The author discusses treatment, usually conservative management, consisting of reduction by manipulation and a hip spica. This is often the only means possible if there are other injuries. When operation is indicated, Knowle's pin seems less traumatic than a Smith-Petersen nail. In some cases there should be no weight bearing for more than a year.

THE SURGICAL TREATMENT OF CERVICAL SPONDYLOTIC MYELOPATHY. L. Rogers, *J. Bone Jt Surg.*, February, 1961.

THE author states that the myelopathy which complicates certain cases of cervical spondylosis, and is caused by the projection of degenerated intervertebral disk or disks into the spinal canal, is an indication for urgent treatment lest irreversible damage be done to the spinal cord. He describes an operation which he has used for six years and has performed 37 times on 33 patients aged 38 to 72 years. He considers the results encouraging and in some cases most gratifying. The indication for surgery is the presence of cord signs, even if they are mild. He stresses the difficulty in removing the bony bars which, as well as the prolapsing intervertebral disk, cause cord compression and myelopathy in the cervical region, and the difficulty of mobilizing the cervical cord by limited exposure. The rationale of his operation is based on the observation that cerebro-spinal fluid tends to produce neural isolation spontaneously, and on the fact that the cervical cord is mobilized when the dentate ligaments are divided. The operation consists of the extensive removal of all spinous processes and laminæ from the occiput to the first thoracic vertebra, the opening of the dura for the full extent of this exposure, careful division of the dentate ligaments in the area, and finally the closure of the spinal muscles over the open dura. The author describes certain neurosurgical precautions in the care of the patients which are necessary to achieve success.

PREVENTION OF THROMBO-EMBOLIC COMPLICATIONS IN ORTHOPÆDIC AND ACCIDENT SURGERY. R. Tubiana and J. Dupare, *J. Bone Jt Surg.*, February, 1961.

THE uses of anticoagulants for the prophylaxis of thromboembolic phenomena in accident and orthopædic surgery are discussed. The authors note the difficulties of early diagnosis intrinsic in patients whose limbs are swollen after surgery, or encased in plaster, and refer to the serious complications that can ensue. They state that, in 2200 operations, these complications occurred in 3·2% of cases, including 1·6% of cases of pulmonary embolism, and 0·13% deaths. The other fact of orthopædic importance was the higher incidence following hip operations. Out of 389 hip operations performed in their clinic in Paris, 15% of patients had thrombo-embolic complications, 9·6% suffered pulmonary embolism, and there were 0·78% fatalities. The authors present a table which gives points for circumstances likely to predispose to trouble. This is in two parts, one comprising individual factors such as age, past history of thrombosis, varicose veins, obesity and pre-operative immobilization; the other consists of factors related to injury or operation. If indicated by the points system, the authors use heparin pre-operatively and, beginning on the third day after operation, dicoumarol ethyl acetate controlled by prothrombin value and the heparin tolerance test, both of which are considered necessary. They keep the treatment going if possible until the patient can walk long distances. They note precautions to take, should such a patient require further surgery.

Points of View.

THE RELATION OF PHYSICAL AND MENTAL DISEASE IN LATER LIFE.

THE concept that the older members of a nation form a social group requiring special study is of recent origin. By sheer weight of numbers the senior citizens of many communities in the western world have drawn attention to themselves. An unprecedented increase in the average length of life has been a product of the first half of this century, and the problems raised by this social change were awaiting investigation as the second half of the century dawned.

It was in July, 1950, in Belgium, that a meeting was held which was destined to become known as the First International Congress of Gerontology. It was attended by 95 persons. The Fifth Congress was held in August, 1960, in San Francisco, with 1200 members from 60 countries who had the opportunity of listening to 500 papers on various aspects of the aging problem. In ten years, world interest in the later years of life had quickened encouragingly.

Prior to the 1960 Congress, a seminar on "Psychological and Social Aspects of Ageing in relation to Mental Health" was held in the same city. It was attended by 60 world authorities, who had been invited to prepare papers on research work in which they were engaged, and by another 20 interested people as observers. The participants at the seminar included social scientists of many schools, and their awareness of the varied factors involved in the preservation of mental health in later life was summed up in an opening statement:

> Psychological and Social functioning are in turn affected by economic status and health status, and hence, problems of income, employment, retirement and health maintenance are ultimately of concern in an understanding of mental health in relation to the ageing process.

The fact that many disciplines are concerned with the maintenance of the mental health of the elderly had previously been stressed by the Expert Committee on Mental Health of the World Health Organization. In its sixth report (1959), the Committee recommends the establishment of institutes of gerontology to cover all areas demanding inquiry at the present time. The need for linking geriatrics and psychiatry more closely to what the Committee calls medicine proper is also stressed.

These two recommendations coming from an official body within the World Health Organization require consideration in Australia. Much planning and financial help will be required to establish an institute of gerontology in this country, but it will eventuate. Government aid and private benefaction will both be looked to for such a project. However, philanthropists are for the most part in the age groups concerned, and some may be found who are sympathetically disposed and able to assist in research into the problems of their less fortunate contemporaries. Gerontological studies already carried out in other lands have been rewarding, and in no other field of sociological and medical research is it possible to benefit so many people.

The second suggestion of the Expert Committee—the closer linking of geriatrics and psychiatry with medical practice—can be taken up immediately. The relation of physical and mental ill-health in older women was studied in a small survey conducted in the Department of Mental Hygiene in Victoria in 1959, and the overlap between the two types of disability was demonstrated. Full details of the survey, including some social and psychological data, will be published later, but in the meantime some figures regarding health status may be summarized.

Geriatric Survey.

In the project three groups, each of 50 women aged over 60 years, were studied. One group represented consecutive admissions to a mental hospital and the second consecutive admissions to a geriatric unit for physical diseases; the third were members of an elderly people's club. It was found that in the mental hospital group, 28 of the 50 had major physical disabilities, and in the geriatric unit group 23 of the 50 were mentally ill enough to be in a psychiatric hospital. In the group drawn from the elderly people's club, 10 had major physical disabilities, and two had mental disorders which required treatment. In each group there were also minor departures from mental and physical health. The need for investigating this aspect of the total problem of old age in Australia seems apparent.

In the two hospital groups there were many types of physical and mental disorders. As would be expected in this age group, the most frequently recurring physical disabilities related to the cardio-vascular, nervous and locomotor systems. Among the mental hospital patients, 23 were suffering from functional mental disorder and 27 from organic brain disease. In the geriatric unit, of 31 women who showed departure from normal mental health, 11 had functional and 20 organic disease.

Mechanisms of Interaction of Disease.

The mechanisms by which physical and mental disease may activate each other are complex and of interest to both the physician and the psychiatrist. Before the processes which may operate within the individual are discussed, the possible effect of one sick person on another may be noted. This can be termed a sociological reaction. A severe prolonged illness, or a "cluster" of illnesses in a short period, in one member of a family may impose an emotional strain on another member, which may prove to be overwhelming. Conversely, the physical exertion of caring for a patient suffering from a neurosis or psychosis in the home may occasionally have an adverse effect on the health of the spouse, child or sibling of the invalid. The French used to warn their recent graduates that when they were called to a house, it might not be to attend the sickest member of the family.

Within the individual himself, the interaction of the two types of disease may be described under five headings.

Genetic Factors.

In later life, genetic factors would not be expected to have the same influence as in the earlier years; but there are outstanding instances of inherited traits. Huntington's chorea is an example of a disease with both physical and mental manifestations which may not appear until the second half of life. Similarly essential hypertension and atherosclerosis, which are known to affect succeeding generations, may not damage cerebral vessels till middle age. Study of the epidemiology of mental disorders in later life has shown a genetic factor in senile psychosis itself. In this organic disease of the brain there occurs a concurrent physical and mental deterioration, which ultimately terminates fatally. At present, treatment of the patient is entirely palliative and symptomatic. There may be differences in the individual mode of death, but this comes only at the end of a gradual and progressive failure of both mind and body. The disorder presents as a tragic caricature of normal old age, and Shakespeare's description of the seventh age of man leaving him "sans everything" refers typically to this pathological phenomenon. Recent investigations point to the fact that this psychosis occurs twenty times as often in the parents of the patients as in the community as a whole (World Health Organization, 1959), although its appearance in the individual may be delayed to the eighth or ninth decade. We cannot choose our grandparents, but possibly for the sake of our children we may be a little selective about our grandparents-in-law.

Cerebral Degeneration.

Combined effects of physical and mental ill-health may often be most clearly seen in chronic brain damage. This may occur from a variety of causes, including infection, chronic intoxication, trauma, tumour and cerebro-vascular

disease. The first successful results of treatment in some of these diseases may be observed in either body or mind. However, there are great individual variations in the effect that a given brain lesion will have, and this has been stated to depend on the capacity of the personality to compensate for the cerebral damage (Rothschild, 1956; Mayer-Gross *et alii*, 1960). As our diagnosis of the overall picture becomes more accurate, there will be more discrimination in deciding the type of hospital brain-damaged patients enter. A cerebro-vascular accident in one individual may lead to hemiplegia and aphasia which are gallantly accepted as a challenge to rehabilitation, and the physiotherapists and speech therapists receive every encouragement from the patient himself in the results they achieve. Though some residual neurological sign may remain, the personality emerges unscathed. In another patient the outcome of a similar episode is different. The memory and intellectual faculties are adversely affected; the mood is depressed, control of the emotions becomes poor, and the end result is arteriosclerotic psychosis. The ability to continue life's interests in spite of an aging brain from which many cells have disappeared, as in senile psychosis, also shows great individual variations.

On the whole, males are subject to more brain damage than females. Men are more prone to brain injury, alcohol and cerebral arteriosclerosis, and it was because the causation of much of their mental disease is often easier to diagnose that the survey referred to above was confined to women.

It has been said that in the place of infections which altered world history in the past, we now have to regard cerebral arteriosclerosis in the leaders of nations as one of the cosmic dangers. Or nearer home, for anyone who may happen to be a small investor, interest may lie in the supply of oxygen and glucose reaching the cerebral cortices of elderly gentlemen sitting up and down a long table at a directors' meeting.

Disease Outside the Brain.

The reason for the brain lacking its essential requirements may, however, lie, not in the degeneration of that organ itself, but in outlying disease elsewhere. This must be searched for in every psychiatric disorder arising in the senium. The age of the patient is not so important as the age of the neurosis or psychosis. A recent change from the hitherto comparatively healthy mental state of an elderly person to one of confusion may be due to a systemic infection, to malnutrition, to altered metabolism, to intoxication, to heart failure, to anæmia or to other departure from physical normality. Almost all psychotic signs and symptoms can be produced in this way.

British psychiatry describes them as symptomatic psychoses and acute confusional psychoses. In America the term acute brain disease or acute brain syndrome is being used. However, the practice is growing in U.S.A. of giving these latter terms a wider scope than the British terminology does, by using them to include the mental effect of any physiological insult to the brain which has occurred in, say, the preceding month, whether that brain was previously damaged or not (Simon, 1960). This interpretation of the acute brain syndrome makes it applicable to many crises in the course of chronic cerebral disease in older people. It is a stimulating approach, as it imposes a duty on the medical attendant to search diligently for any physical condition which has recently worsened. This concept of the acute brain syndrome occurring in patients with mild senile or arteriosclerotic psychosis is leading to study of the prognosis of these cases. If it is shown that a permanent deterioration follows many of these acute episodes, the attempt to prevent them from occurring could be rewarding (Simon, 1961).

The foregoing discussion has referred to aspects of the mechanisms by which impaired physical health is responsible for symptomatic and organic disease in the brain. However, physical disability may also be an important aetiological agent in functional mental disease.

Somatopsychological Factors.

The older patient is aware of his failing powers, and every new ailment may be accepted by him as an added burden to his already sick body and mind. Any physical infirmity, whether of movement, wind or the special senses, tends to increase his egocentricity, and to generate a feeling of rejection or frustration. In this age group, patients are peculiarly susceptible to the suggestion, imposed on them by themselves or others, that the latest illness they are suffering may be their terminal one. Physical illness in later life is a test of the emotional and spiritual maturity of the individual. A well-adjusted personality, with the aid of his physician, may negotiate a serious illness successfully. The inadequate type, who may have effectively concealed a life-long neurotic trend until age and illness have caught up with him, may succumb to an affective or paranoid psychosis. For such a patient, a withdrawal of sorts from the total environment appears the only way out of an intolerable situation.

Apart from those physical diseases which threaten life itself and are accompanied by thanatophobia, there are many types of bodily ailment which react on the mind. All those disabilities which tend to isolate the patient may be considered here, as well as those which require treatment for long periods in strange surroundings. Physical ill-health is often a means of ushering in great changes in an old person's *milieu*, just at the time when he is least able to adjust himself to change.

Of special interest in this connexion is the effect of diminished sight and hearing. It has been pointed out recently that females, and especially spinsters, are particularly liable to develop paranoid symptoms with failure of these special senses (Mayer-Gross *et alii*, 1960). The elderly unmarried woman in Australia has so far had no special research directed on her, but there is reason to believe that she enters both mental hospital and geriatric unit in proportionately very much larger numbers than her married sister, even though the latter may be widowed.

Psychosomatic Factors.

There is disinclination to extend the scope of psychosomatic disease too widely, so a halt is usually made before mental disease is included. As is stated in Cecil and Loeb's "Textbook of Medicine" (1955):

> If psychosomatic medicine were to include the disorders which seem to be related to the effect of psychological stress on the nervous system itself, it would include too much of psychiatry.

However, in geriatric psychiatry, after the physical causes of mental disorder have been searched out and treated, there remain many cases in which emotional stress and psychological mechanisms have fired off a mental disorder which has bodily repercussions. Emotional and sociological influences may not control the type of illness, but will have a bearing on the time and situation in which the physical disability occurs.

It is in these psychogenic mental disorders that medicine and psychiatry will ultimately have to call in other disciplines. Psychology, sociology and economics will all have an important contribution to make. At present, one of the hazards of old age is that loss of health may not come alone, but may be accompanied by loss of occupation, income, status, friends and sometimes spouse. Awareness of this in the elderly may lead to a fear of aging. The crippling effect of all these stresses on mind and body leads not infrequently to old age itself having to be regarded as psychosomatic.

Already much study has been done in other lands on the problem of unsuccessful aging, and continuation of the work in this decade will achieve much more.

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Out of the Past.

CREMATORIUM AT ADELAIDE.[1]

[From the *Australasian Medical Gazette*, February 20, 1903.]

THE building for the Adelaide Crematorium has been completed, and the furnace was last month submitted to a trial. Only members of the society were invited to attend, and Mr. R. Barr Smith came over from Melbourne specially to be present. The body of a sheep, enclosed in a suitable coffin, was placed in the crematorium. Within half-an-hour the process appeared to be nearly complete, but the burning was continued longer than was expected, and it was an hour and ten minutes when it was finished. The trial was considered to have been completely successful. It is to be hoped that the example set by the Cremation Society of Adelaide will soon be followed in the other large cities of the Commonwealth, and the rational and hygienic system of disposal of the dead by cremation be universally adopted.

Medical Societies.

PÆDIATRIC SOCIETY OF VICTORIA.

A MEETING of the Pædiatric Society of Victoria was held on October 12, 1960, at the Royal Children's Hospital, Melbourne.

Medical and Pædiatric Education Overseas.

PROFESSOR V. L. COLLINS, who had recently returned from overseas, said that during the year he had visited medical schools and pædiatric centres in the United States, Canada and England, and some centres in Switzerland and Holland.

One of his chief objectives had been to investigate methods of teaching pædiatrics at the undergraduate level, and to see how the teaching of pædiatrics was integrated into the medical curriculum. At the same time, he had been interested in aspects of post-graduate education, for that type of education, particularly for resident medical officers, was well organized in the U.S.A. He was specially interested in the changes and present thinking in medical education, for it appeared clear to him that many changes were necessary in the Australian approach to both medical and pædiatric teaching. The medical curriculum had remained relatively unchanged in Australia (except for many additions) during the last 30 or 40 years. With the growth of medical knowledge, the student had been required to learn more, and additions to the curriculum had been considerable. He did not know what additional time had been added in Melbourne, but at Stanford University, California, it had been found that in the 15 years to 1955, 900 hours of required time had been added to the curriculum—an addition of almost one academic year. The danger had arisen that medical graduates were not really being educated, but trained as technicians. Any professional education required the maintenance of a skilful balance between education and training. By training was meant the process whereby the student was required to assimilate numerous facts and develop skill in certain techniques, but did not necessarily explore the reasons for doing that or the basis of evidence as to their validity. Training did not necesarily improve the mind, and could actually do harm by suppressing curiosity, insight and the capacity to learn from experience. In true education, the student was encouraged to work and to think for himself, and to develop the art of utilizing knowledge. He learned in terms of attitudes to, and the approach to, his problems. Professor Collins believed that serious attention needed to be given to the present method of educating the student, to ensure that graduates were educated men in the best sense of the term and really knew how to think for themselves and utilize knowledge. He suspected that the medical curriculum had already become so over-burdened with the learning of facts that that was not possible. The growth of medical knowledge had been so great and had continued at such a speed that no one could grasp the whole of it. As much could be taught by what was left out as by what was included.

Professor Collins went on to say that the plan of the medical curriculum had originally been based upon the training of a sound and safe family doctor, who had a good grasp of all aspects of medicine, and who could treat most conditions himself. He wondered whether the curriculum today really met the needs brought about by the great changes in medicine in the last few decades—for instance, the control of infections with all its implications, the shift of emphasis to other social problems and emotional disorders, and the tremendous growth of specialization, and with it the changing rôle of the family doctor. In the United States of America, there had been a recognition of that problem for some years, and there had been a number of vigorous attempts to revise the medical curriculum. In England there had been very few changes to date, and the curriculum followed was similar to that in most centres in Australia; but with the changed attitude of the General Medical Council changes were being made, and some were quite extensive.

Professor Collins then said that before he discussed the curricular changes and the place of pædiatrics in the curriculum, he thought it would be wise to provide some background to pædiatrics in the countries overseas, in view of the fact that the pattern was very different in England and North America. A good review of pædiatrics in three countries—England, the U.S.A. and the U.S.S.R.—had been given in that excellent book, "Modern Trends in Pædiatrics", by Holzel and Tizard. It was a clear account that could be recommended to all pædiatricians. In England, there was a clear-cut pattern as between general practitioner and consultant. The general practitioner did the work of the family doctor, and any problems were referred to the consultant or specialist who, under the National Health Service, had become much more readily available, not only in the large centres, but in many provincial areas where the provision of consultant services had previously been impossible. The pædiatrician was a consultant much as he was known in Australia, but more definitely consultative. There was no doubt that the National Health Service in England had greatly improved pædiatric services (as it had done with most specialist services), and that more pædiatricians were now available for consultation than ever before, and there was an excellent relationship between pædiatrician and general practitioner. In the U.S.A., the pædiatrician was essentially a good general practitioner for children, and the medical centre with its specialist staff and research facilities usually supplied the consultant needs of the pædiatrician. In the more populated areas, and particularly in the eastern part of the U.S.A., most of the pædiatric care in the community was provided by pædiatricians. In the less populous areas the general practitioner was still the first source of medical advice. Some Australian pædiatricians had realized, from reading the American journals, that there had been some dissatisfaction with the work and training of pædiatricians in the United States of America. That was apparent from a leading article in *Pediatrics* by Charles D. May in February, 1959, on the "New Pediatrics". The question was raised as to whether pædiatricians were educated to deal with the type of problem they commonly met in practice, and whether, in fact, they could give adequate time to some of the problems which challenged them, especially the psychological aspects

[1] From the original in the Mitchell Library, Sydney.

of child care. The pædiatricians were often trained in centres where they saw many of the rarer problems upon which research had been carried out, but in practice the greater part of their work consisted of well-baby work, much of which would be done in Australia by the health centre sister. They saw a limited number of children who required treatment in hospital, and recently one survey conducted in a group of pædiatricians showed that the number of patients sent to hospital by each in one year varied from eight as a minimum to 25 as a maximum. In the U.S.A., the trend for the patient to go direct to a specialist had grown enormously in recent years. There were many who had their doubts as to whether that was the soundest policy, and who considered that there should be a place for a family doctor, that a family doctor should be a doctor who had special training for that type of work, and that he should probably be something of a combination of a pædiatrician and internist (physician). Others believed the public had become so used to obtaining advice from the specialist that they would not change to a family doctor. Many did not like the word "general practitioner", for that meant to them a doctor who operated without the qualifications of a surgeon, and they preferred the term "family doctor".

Professor Collins went on to say that if they were to understand the background of medical education in the U.S.A., it appeared important that Australians should know more about the organization of the hospitals in medical schools there, for they had a very different system from that in Australia or England. Since many Australians now visited the States, it was important to recognize and, if possible, to understand that difference. As far as he could see, the medical schools in the United States departed quite definitely from the British approach in 1910, following the Flexner Report. That report set a new pattern for medical schools, and had scientific medicine as its objective and specialization as the dominant pattern. It initiated the trend of development more along European than along British lines. The change had occurred first at Johns Hopkins Medical School in 1911, when, with the aid of Rockefeller grants, clinical departments encouraging the more intensive scientific study of medicine were established. That approach was reinforced in the 1920's by the large sums of money donated to the medical schools for research purposes. The great increase in wealth in the United States in those post-war years made possible numerous grants to medical schools, and there were some magnificent gifts which had influenced the development of some centres ever since. More money was available for research staff who occupied an important place in the hospital, both as clinicians and as teachers. In the years following the second World War, the growth of research in the medical schools in the United States had continued at an increasing rate with the large sums of money made available from Federal resources through the National Institute of Health. Professor Collins understood, for instance, that after the war some $700,000 a year were available for research from that source. By 1960 some $400,000,000 were being spent on medical research through that fund, and it was planned that by 1970 two billion dollars would be available through the National Institute of Health. If a medical centre had research facilities and a few key research staff to initiate research projects, the staff could apply to the National Institute of Health for funds for research fellows in various fields of work in their departments. It could readily be understood what an important place research had played in medical centres. Not only were there liberal funds available, but many undergraduates were attracted to the field of research during their course and could obtain research positions soon after graduation. In most pædiatric centres there could be found a pattern of medical organization in which the clinical material was made readily available for research, and in which there were special departments in many fields of pædiatrics headed by good research pædiatricians—for example, in metabolism, endocrinology, cardiology, neurology, renal diseases, gastro-intestinal diseases and so forth. Each of those clinics had referred to it all the patients in its special field of pædiatrics, and the man who was directing research was also responsible for patient care—in-patient and out-patient—and for much of the teaching in that field. That approach to organized research had certain effects upon both teaching and patient care which had been realized more fully in recent years. The research specialist was not necessarily skilled in the art of medicine or interested in seeing the problems of his patient as a whole. As a scientist he might be excellent, but as a comprehensive doctor he was often inadequate. Fields of medicine which did not lend themselves to a scientific study, such as the field of human relations, psychological medicine and social pædiatrics, tended to be omitted and not taught, though in recent years there had been many attempts to make up for that lack. Undoubtedly the teaching of scientific medicine as such was frequently well done, but it had been realized in many centres that it was one aspect of medicine only, and now there was a swing to a more comprehensive approach to medicine. There was more interest in the patient as a human being, and in his social environment and its effect upon him. In the past, as now, the student was subjected to a stimulating atmosphere with the great interest in scientific medicine and the numerous keen research workers around him. However, the teaching and experience were often unbalanced in the broad fields of medical practice. More recently, one way of meeting that deficiency had been that of arranging family-care programmes in many medical schools. Patients or a family were allotted to the student early in the curriculum, and he followed those families through for a number of years. That undoubtedly had been a great improvement.

A few words should be said about the background of the medical student in the States. There were 86 medical schools in the States, and 12 in Canada. The medical student did three years of a college course—in fact, he often completed four years after secondary school—and obtained a B.A. degree before commencing at a medical school. He then did a four-year medical course. In other words, he had spent eight years' equivalent of university work, compared with six years in the University of Melbourne. The student commencing his medical course was, therefore, rather more mature than Australian medical students, and he undoubtedly worked harder and more seriously during his four years. Some 40% of medical students were married, and 50% had one child before their medical course was completed.

A number of centres had made major changes in the curriculum in the last 10 years. The most vigorous and extensive of those changes had been made at the Western Reserve University Medical School, Cleveland, where, with the aid of a large grant from the Commonwealth Fund, a completely new curriculum had been developed and followed over the past 10 years. Professor Collins said that during his recent visit to the U.S.A., he had spent a short period observing the work in that centre. The University of Colorado had also made extensive changes to the curriculum, and he had observed and discussed those changes when he was in the U.S.A. in 1951. The Harvard Medical School since 1953 had made changes, particularly in the pre-clinical years of the course. More recently, Stanford University at Palo Alto (30 miles south of San Francisco) had developed an entirely new curriculum. The decision to develop that new medical school had been taken in 1953, when it was planned to discontinue their association with hospitals in San Francisco and to build a new hospital on the Stanford University campus as part of the complete new medical school. The alterations to the medical curriculum in those centres were planned to meet the defects mentioned earlier, and at Stanford were based on three concepts. The first was that education was a continual process, and it was therefore necessary to bridge the separation of medical and pre-medical work and to foster integrated teaching where it was likely to contribute to the learning effort of the student. Secondly, it was believed that the growth of medical science was so great, and was continuing at so rapid a pace, that its comprehensive coverage could not be achieved; but that at the heart of medicine was a core of medical knowledge which should be presented to all medical students irrespective of their eventual choice of medical career. Thirdly, as a corollary to those two principles, emphasis was placed on learning in terms of attitude towards, and approach to, problems in medicine, rather than in terms of the acquisition of techniques and the accumulation of data at the expense of interpretation. There was less emphasis on the acquisition of facts and less emphasis on the didactic approach to learning.

Professor Collins said that the changed curricula had certain features in common. The most important were the emphasis upon the integration of teaching, the study of growth and development, an early and gradual introduction to clinical medicine, and the use of free time. The extent to which teaching was integrated varied in different centres, but it had become an important feature in the first two pre-clinical years particularly. In the teaching of the structure and function of the human body it could be most helpful. The student might first be taught about cell structure and function, and that might include cellular histology, biochemistry, microbiology, pharmacology and pathology. The student then made a study of systems of the body — renal, pulmonary, cardiac, musculo-skeletal,

nervous and so on. In that teaching, the basic science and the clinical science departments collaborated in the presentation of subject matter of common concern. Clinicians would present certain facets, for example, of renal disease or disturbed renal function, at the stage when the anatomist or the physiologist was involved in teaching renal structure and function. At Cleveland, Professor Collins had attended a lecture to first-year students in biochemistry at the stage they were being taught carbohydrate biochemistry. The pædiatrician presented one child with galactosæmia and another with glycogen-storage disease, and then the lecturer proceeded to discuss carbohydrate metabolism and the enzyme systems involved. The medical course at Cleveland was perhaps the most highly integrated in that regard, and many committees for the various phases of teaching were continually engaged upon assessment of the achievements and problems of organized teaching. The help of other university departments might be enlisted in any of the medical years to broaden the interest where necessary — for instance, sociology, anthropology, philosophy, history and psychology. The second feature in the new curricula was the emphasis upon growth and development. The study of the human body in terms of human biology and the understanding of the problems of growth—physical, chemical or psychological—were regarded as most important. It made for a dynamic approach to the study of structure and function. It seemed reasonable that the study of embryology should be followed by the study of growth in childhood, both physical and emotional, and could lead on to the development of personality and the place of the individual in society. Thirdly, there was usually a gradual introduction to clinical medicine in the first two years. That would include aspects of the development of personality, laboratory medicine, physical signs in medicine and the presentation of certain clinical problems in the early years. The fourth feature was the concept of the use of free time. In each year, the student might have as much as six weeks' free time in which he could choose his field of study. The opportunities for selective study were regarded as most important. The student might simply review required material, he might carry out a small research project, or might even extend his research project into the holiday time and be paid for it during his holidays. He might wish to attend another medical school to study in a certain field of medicine there, or he might even visit a country overseas. When in London, Professor Collins had met a student from Philadelphia who was studying the National Health Service in Great Britain as part of his elective work, and the student informed him that at least half of those in his year were in either England or Europe doing elective work. That was merely one facet of American teaching, where there was a much greater emphasis than in England or in Australia upon student participation—the concept that the student learnt best by doing work himself.

Professor Collins said that there were other features of interest in each of the centres mentioned. At Stanford, for instance, it was planned that there should be a five-year medical curriculum instead of the previous four-year course, and that in the first three years, time amounting to one academic year would be made available to work in any department of the university, whether in the natural or social sciences, the humanities or the fine arts. The student could commence after his three college years and complete the B.A. degree in any one of those fields, but the main objective was that of providing a broader and more cultural education. It was also planned that in the last year, six months would be spent in the out-patient department doing mainly clinical work, and the student would be able to follow up his patients over return visits. At that centre, though many of the patients coming into the medical school would be private patients, they would still see the student first before being reviewed by the teacher or clinician. As the university was a private university, the cost of hospital expenses had to be met largely from the fees of private patients. In Cleveland, there was a highly integrated medical curriculum, and both staff and students were most enthusiastic about its achievements. The students made the statement that the teachers themselves knew what other teachers were teaching. There was no doubt there were great advantages to staff, in both the clinical field and in the field of basic sciences, in knowing a great deal more about each other's work and teaching rôle than was customary. One interesting experiment at Cleveland had been the development of a family clinic programme, in which the student was allotted to a family in his first medical year. He was usually allotted to a normal mother during the latter part of her pregnancy, attended sessions in ante-natal care and the confinement, and attended the mother and child subsequently at home. He was made responsible for the care of that family, particularly the infant, and could refer his problems to a preceptor. That, too, provided a basis for his teaching in growth and development. He undoubtedly learned a great deal about the social background, the type of mother and father and their relationship to others in the family group. He took part in the usual well-baby clinic activities and immunization programmes, and could readily consult with his tutor. Though there were many good features in that family clinic programme, Professor Collins was told that it was still a much-debated experiment, mainly because it placed rather too much responsibility upon the student in the way of meeting inquiries and problems which were presented to him by the family. The good student managed reasonably well, but the less secure student found it worrying. Another interesting development was the continuity clinic, where the student could follow through for many months certain patients seen in the wards or the ambulatory clinic, again with the aid of a tutor, who was able to give him a great deal of time in discussing the problems of his patients. During his course, too, each student did work upon an approved project and presented a thesis.

At Boston Children's Medical Center, Professor Collins had been interested to see the work done in the family clinic for the training of resident medical officers. The same clinic was used as an "elective" for students. Residents were allocated to under-privileged families and looked after them in health and disease. That scheme provided good experience in the field of social pædiatrics and the more common ailments, as well as in the usual well-child health programme. He had been very impressed with some of the discussions he had heard upon the common diseases, and undoubtedly that was a vigorous attempt to provide training in preventive pædiatrics and in the field of common pædiatric disorders. The medical students at Boston spent six weeks upon pædiatrics in their third year and four weeks in the fourth year, in addition to the integrated teaching which had taken place in the first two years. In their fourth year, the students acted as junior house officers, and were responsible for writing up the patients' details as part of the hospital records.

Professor Collins said that in the United States, the enthusiasm, and was something from which Australia impression upon the visitor. There were probably many reasons for that, and it was worth seeking some of them. He had little doubt that the emphasis in the United States upon student participation contributed greatly to that enthusiasm, and was something from which Australia could learn. It was constantly emphasized that the student learned by doing things himself rather than by listening to his teachers. In out-patient teaching, for instance, two students were usually allocated to a tutor; the students took a full history and examined the patient and then discussed the problems with their tutor. They finally returned and talked to the parents and advised on treatment. That undoubtedly gave the student a sense of responsibility, and he might be asked to review the problems and present certain aspects to a group in which there was further stimulating discussion. That was excellent as far as it went; yet he thought that out-patient teaching lacked something which would be regarded as important in Australia and which was regarded as important in England. That deficiency was the art of teaching how to carry out a good consultation in the manner that Sir James Spence considered desirable. It was done by providing the student with opportunities of observing and listening to an experienced consultant at work. Professor Collins believed that a combination of the American approach to student participation and the British approach of demonstrating how a good consultation was carried out in the out-patient department was required. However, the danger of the student becoming too passive as an observer should be avoided. Other factors contributing to the enthusiasm of the student were the opportunity for frequent discussion with a preceptor, the encouragement given to read around and discuss problems and, as had previously been mentioned, the student's close association with many members of staff engaged actively in research. Clinical teaching differed from Australian teaching in many ways—for instance, residents played a bigger part. A full discussion upon a patient had a different emphasis, too, for after the history, physical findings and full investigation (work-up) had been completed, a great deal of discussion centred around the investigations. However, he believed that in clinical teaching there should be discussion initially upon the complete history, and discussion concerning the possible diagnoses and the importance of various symptomatic features; at the end of the physical examination one might discuss how the approach had been modified, and finally, after the priority

that special investigations should receive had been emphasized, discussion could centre upon the contribution the various investigations had made, or on their relevance. A doctor in practice so often had to make a diagnosis upon the history alone, in the presence of normal physical findings, that it seemed clear that they should continue to teach the proper assessment of symptomatic features.

In England, there had been no radical changes in the medical curriculum to date. A number of centres were discussing changes, and in Newcastle the framework of a new curriculum had been worked out. There had been experiments in a number of centres in England and Scotland providing experience for the student in the field of general practice. In pædiatrics, too, compared with the U.S.A. there was better teaching in the field of preventive medicine and social pædiatrics, with the student doing some work in health centres, learning about the School Medical Service, visiting with health visitors or being taught in an atmosphere in hospital in which there was obvious consideration of the whole social background of the patient and the part the various community services might play in his welfare. In some centres, too, such as at Sheffield, under Illingworth, there was excellent teaching in the field of normal growth and development, along the lines emphasized in Illingworth's recent book. In London, most of the clinical schools had some link with infant health centres, and in some cases the infant welfare centre was attached to the teaching hospital. At Great Ormond Street, the Province of Natal Clinic provided a broad range of normal preventive services for the children in that area. There was not much opportunity to assess teaching on the Continent, but it had been clear from what he had seen that in Switzerland, for instance, the lecture to a large group of students was still an important method of teaching, and that in some centres there was very little, and sometimes no, out-patient pædiatric teaching.

Professor Collins mentioned the changes in the new medical curriculum being considered at Newcastle in the University of Durham to emphasize current trends. In general, it was planned to include many of the features that he had observed in the U.S.A. The proposals had been worked out after a great deal of discussion, and initially teachers were asked to write an essay upon what they thought a medical student should be taught and their objectives in his training. What qualities and knowledge should a doctor possess on qualification? It was considered that the graduate should have developed an attitude to medicine which was a blend of the scientific and humanitarian. He should know that conclusions should be reached by logical deduction from facts, and he should be able to assess evidence both as to its reliability and as to its relevance. In his professional standards, he should be imbued with the high ethical standards required of a doctor. He should have learnt how to deal with patients and their relatives with sympathy and with an understanding of human behaviour. He should have a knowledge of human biology in its broadest sense, and should understand in general the relationship of man to other living beings. He should possess a broad knowledge of the structure, function and development of the human body, of the factors which might disturb them, and of the disorders of structure and function which might result. He should know something of the structure and function of the society in which he lived and how it had developed. In regard to clinical knowledge, he should learn how to elicit facts from the patient. He should have a good knowledge of those diseases which were an acute danger to life and of the more common disabling diseases. He should recognize the limitation of his own clinical knowledge, and should be prepared when necessary to seek further help. He should understand the effect of environment on health, and should appreciate the responsibility of his profession for the prevention of disease. He should appreciate that medicine was a continuing education, and that he had an obligation to remain a student and to contribute if he could to the progress of medicine throughout the whole of his professional career. It had been accepted, too, that the achievement of as great a degree of integration as was possible and sensible during various parts of the curriculum was desirable. For instance, Stage I of the course (the equivalent of the Australian first year in the medical course) would be concerned with the study of human structure, function and development, and growth and teaching could be in a form in which "systems" rather than "regions" would be presented to the students. At that stage, too, study of human social relationships would commence, and that would be continued at later stages. The importance of limiting the amount of factual information the undergraduate was required to assimilate was recognized. It was realized, too, that there were educational advantages to be gained by the student being required to engage in clinical and experimental inquiry, and the desirability of a reasonable amount of free time being available for the student would be a guiding principle. Finally, there was constant appreciation of the fact that the enthusiasm of the teacher was more important than the form of the curriculum. Professor Collins, in conclusion, said that that was something which must always be emphasized. There was no doubt that if the teacher was not enthusiastic and had no real interest in what he was teaching, no educational programme could be satisfactory no matter what type of curriculum was planned.

Correspondence.

THE MERVYN ARCHDALL MEDICAL MONOGRAPH FUND.

SIR: Through your columns I would like to call the attention of members of the medical profession to the "Mervyn Archdall Medical Monograph Fund". This fund was so named by resolution of the Federal Council in August, 1960, in recognition of the fact that it was established through the efforts of the late Mervyn Archdall. It was the opinion of Council that no more fitting way of perpetuating his memory and his services to medicine in Australia could be determined upon than by establishing this fund upon a secure and permanent basis.

The availability of such a fund appealed to Mervyn Archdall as a means of overcoming a problem he met with from time to time in his editorial capacity. This was the difficulty of dealing with an article which by reason of length was beyond the scope of the Journal, but by reason of quality was well worthy of publication in the form of a monograph. This was the project dear to the heart of Mervyn Archdall, and the origin of the fund was entirely due to personal approach by him to a wide circle of friends and acquaintances throughout Australia.

The publication of a monograph is a very costly business, and recuperation of the fund from sales is necessarily very low. The fund has been used already for the publication of two monographs, and as a consequence has been reduced to a level which is barely adequate to allow consideration of a further publication.

I feel that I can with confidence appeal to the profession throughout Australia to support a fund which aims at furthering the art and science of medicine in Australia, and in so doing also perpetuates the memory of one of the great figures in medicine in Australia.

Yours, etc.,

H. C. COLVILLE,
President, Federal Council of the B.M.A. in Australia.

Collins Street,
Melbourne.
June 8, 1961.

ON OXYGEN POISONING UNDER WATER.

SIR: The article by Dr. D. T. Burke of Adelaide on "Oxygen Poisoning under Water" (MED. J. AUST., May 13, 1961, page 693) shows evidence of considerable thought about the subject. It would be of use and interest to know what association Dr. Burke has had with personnel diving "on oxygen". Particularly is this so as the final paragraph in his summary is critical in destructive fashion of the safety laws laid down for oxygen diving.

The use of oxygen in diving in closed-circuit sets, in addition to giving an extraordinary sense of peace and quiet and the means to approach fish close for long intervals of time without alarming them, is of strategic importance in warfare, as there are no revealing bubbles. My impression is that breathing tends to be quieter and slower on oxygen rather than hyperventilated by any autonomic reflex as Dr. Burke suggests. After six years' close association with this kind of diving, one cannot readily accept Dr. Burke's statement that "it is futile to speak of safe depth-exposure times during the use of oxygen-rebreathing equipment". One has seen, certainly, a number of cases of "shallow-water blackout" in this time (and has seen and experienced the extremely uncomfortable "proto-cocktail", which may

also occur as a hazard if water enters the carbon-dioxide absorbent canister), but no fatal cases have been seen although such cases are known to result at unwelcome frequency in some places. Careful and accurate tables are laid down for divers using oxygen. They have been arrived at by consideration of the factors Dr. Burke mentions, with the addition of the arbitrary findings of long practice.

The few cases of "shallow-water syncope" which we have met have, on analysis, all shown one or several predisposing factors, which were usually avoidable and should have been avoided if the man had followed all the dictates of his training. The commonest cause was that the individual had departed from the rules of adequate sleep, adequate food, had reached a state of exhaustion, or had carried out strenuous exertion prior to his dive, and had thus commenced his task at a physiological disadvantage such as with depleted liver and muscle glycogen. In some cases the causes were: inadequate preparation of equipment by the individual — e.g., wearing inadequate weights with the necessity constantly to "swim down"; wearing ill-fitting gear resulting in chest constriction; attempting to compensate for navigational errors below water by swimming at maximum speed for long intervals; exceeding the safe depths for unsafe intervals either knowingly or by error. Mouth-twitching is a valuable sign for many people, which is always heeded as a warning.

It is agreed that the ultimate mechanism of the loss of consciousness has to do with some failure in nutrition of the cortical cells, as by cerebral vasoconstriction, hypoglycæmia, hypoxia (whether primary or secondary to some mechanism associated with breathing 100% oxygen under increased pressure with an efficient carbon dioxide absorber keeping carbon dioxide level to minimal proportions) or some other pathological mechanism. However, this is very different from saying that the laid-down "safe depth-exposure times during the use of oxygen rebreathing equipment" are "futile" because there are a number of variables involved.

Apart from this point of contention, one can find only praise for the article.

It is extremely difficult to assess accurately the physiological basis for some of the many rules laid down by long usage over the years. For example, the invariable necessity for "flushing through" prior to leaving the bottom probably has to do with the release of carbon dioxide from the body, with decreasing pressure adding to that already present and producing a high level before it can be removed by the absorbent, this then resulting in hyperventilation in turn possibly giving cerebral vasoconstriction which, combined with a reducing blood pressure as ascent is carried out, then produces a loss of consciousness. (Many cases of loss of consciousness occur only on the final ascent from the dive.) The mechanism involved in this, however, appears to need further elucidation.

There seems to be general agreement among divers and medical personnel associated with them that hyperventilation is a dangerous practice whether on oxygen or air. Many people are familiar with the schoolboy trick of asking a person to hyperventilate, then compressing his thorax firmly by encircling with the arms from behind and asking him to put his head well back. In many cases the victim then falls to the floor unconscious. In the ascent from a dive, the man may have hyperventilated to "clear" the counter lung, he has had his thorax under pressure (though not constricted) at depth and is now having the pressure rapidly reduced. He often holds his head back to look up (thereby lengthening, and reducing the calibre of, the common carotid arteries—as the writer has demonstrated on the fresh cadaver). He is, in fact, simulating the schoolboy trick and is in danger of lapsing into unconsciousness.

This matter is mentioned both in support of Dr. Burke's implication of hyperventilation in "oxygen poisoning" and in criticism of it, in that it seems there are other factors which, while strongly predisposing to loss of consciousness in practice, are unrelated to the use of oxygen. It is, therefore, necessary to differentiate carefully in deciding which factors are due to oxygen under pressure.

For what use it may be to others in detecting predisposition to "oxygen poisoning", we have found a low carbon dioxide tolerance is almost always a good guide to the likely subject. It may be that he has, as it were, a reduced volume of buffer substances to pH changes in his blood and tissue fluids, although one realizes there is no detectable pH change in oxygen poisoning. The usual precautions should always be taken to exclude the epileptic, the hypertensive, the post-cranial traumatic case and possibly even the very bad-tempered person from oxygen diving. Certainly no strychnine tonics should be given to persons on this type of work. The hypotensive, the hypovolæmic and the anæmic should, of course, be excluded to avoid cases of "shallow-water syncope". In practice the incidence of cases is small with the above precautions and with the observance of the standard depth-exposure times.

The British Subaqua Club has banned the use of oxygen sets—possibly because the above medical precautions and selections cannot be made satisfactorily for its members, and because many civilian amateur divers are inclined to ignore what they regard as tedious rules for their safety. They are inclined to want to find out for themselves—with disastrous results. The Australian U.R.G. and U.S.F.A. have discouraged the use of oxygen sets among their members also.

We are grateful to Dr. Burke for his detailed work and interesting hypothesis.

Yours, etc.,

1 Elizabeth Bay Road,
Elizabeth Bay,
New South Wales.
June 6, 1961.

SHANE WATSON.

PHYSICIAN, PROTECT THYSELF!

SIR: In the past five months you have published three papers (Bouvier,[1] Birrell,[2] Money[3]) on road accidents. These papers are important, not only for their content, but also because their appearance indicates an increasing interest by the medical profession in this most serious community problem.

Though no medical agency is directly concerned with any aspect of the control of road accidents, their very high human cost qualifies them as a public health problem on almost any definition of public health. Further evidence of medical awareness is provided by the present interest of the Australian College of General Practitioners and by the setting up of a committee on the subject by the National Health and Medical Research Council. But doctors have, or ought to have, a direct personal concern with road accidents. They are themselves heavily exposed to risk of accident, because they depend so much on private car transport. They are frequently pressed for time, and they have to drive when they are tired. They are heavily at risk, too, as regards the consequences of an accident. A doctor's income comes largely from personal services, and it ceases if he is incapacitated. Insurance and other financial arrangements may help a little, but nothing can offset death or the long-term results of, say, a bad head injury. Probably no other group in the community has more to gain from the crash protective devices which Dr. Birrell and Dr. Money have advocated. This is becoming recognized in other countries—for instance, in the mountain States of U.S.A., 60% of doctors have safety belts in their cars.

When planning to buy a new car, doctors should give high marks to those which have built-in safety features, such as recessed steering wheels, effective padding on the dash, and door latches designed to resist opening if the frame is distorted. There is no way of knowing, by simple observation, whether these features are fully effective, but it is easy to see if the car has them. The proportion of new cars with such features is increasing, though rather slowly. Of 78 different models at the 1961 Motor Show in Melbourne, 27% appeared to have safety door latches, 46% recessed steering wheels and 55% padding of some kind; 38% had two of these features and 11% had all three.

Safety belts have the advantage that they can be fitted to existing as well as to new cars. As an incentive, if any is needed, sales tax has now been eliminated. One hopes there will be belts available very soon which meet the Australian Standard[4] just published. The Snowy Mountains Authority, which has fitted belts to its own vehicles, has produced a small booklet[5] about safety belts, with clear sketches showing how to install both lap and diagonal belts. The booklet was prepared for their own staff, but the

[1] MED. J. AUST., 1961, 1: 122.

[2] MED. J. AUST., 1961, 1: 505.

[3] MED. J. AUST., 1961, 1: 655.

[4] Standards Association of Australia, 1961, "Safety Belts and Harness Assemblies for Motor Vehicles". Australian Standard E-35.

[5] Snowy Mountains Authority, 1961, "Facts about Safety Belts for Road Vehicles", Cooma.

Authority will supply copies on individual request. The process of installing belts will be a matter of fastening snaphooks on many of next year's imported cars. The 1962 models of all American and two large English manufacturers will have properly engineered attachment points as a standard fitting. Let us hope that Australian car manufacturers are not slow to follow this lead.

Self-medication is not usually recommended, but there is one prescription every doctor can write for himself:

℞

Safety belts *q.s.*

Yours, etc.,

J. C. LANE.

24 Smith Road,
Camberwell,
Victoria.
July 4, 1961.

Post-Graduate Work.

THE POST-GRADUATE COMMITTEE IN MEDICINE IN THE UNIVERSITY OF SYDNEY.

Practical Instruction and Training in Anæsthesia for General Practitioners.

THE Post-Graduate Committee in Medicine in the University of Sydney, in conjunction with the Medical Faculty of the University of New South Wales, announces that opportunities for practical instruction and experience in anæsthesia suitable for general practitioners will be available at the Prince Henry Hospital from September, 1961, for periods of one to four weeks. Limited accommodation will also be available at the hospital. The fees will be £3 3s. per week for external attendance, £7 2s. per week with board and residence. Applications will be booked on receipt of fees in the order in which they are received. Applications should be addressed to the Course Secretary, Post-Graduate Committee in Medicine, Herford House, 188 Oxford Street, Paddington, New South Wales. Telephone: 31-0671. Telegraphic address: "Postgrad Sydney".

Correspondence Course in Hæmatology.

The Post-Graduate Committee in Medicine in the University of Sydney has completed arrangements with the Kansas Medical Centre, Kansas City, U.S.A., whereby the Committee will distribute in Australia, New Zealand and the Pacific Islands the Centre's correspondence course in hæmatology. The course, prepared and edited by Sloan J. Wilson, M.D., and William E. Larsen, M.D., of the Section of Hæmatology, Kansas Medical Centre, is designed to present the most frequently observed hæmatological disorders. Each of the nine monthly lessons is a case report. The course materials include 65 35 mm. coloured photomicrographs of peripheral blood and bone-marrow preparations, together with complete clinical and laboratory data. Reproductions of electrophoretic patterns and röntgenograms are included to present important findings. A question and preliminary study section will be mailed to enrolees at the beginning of each month. Two weeks later, the answers and a discussion of the hæmatological disease concerned will be forwarded. Correspondence and comments arising out of the course will be dealt with by the course supervisor. All materials become the property of the enrolee and, on completion of the course, include a labelled notebook, complete data of study cases, a discussion of each disease illustrated by the study cases, 35 mm. coloured photomicrographs and photographs. Distribution of the course is planned to begin within the next three months. The fee will be 20 guineas (£A21), plus extra postage for New Zealand and Pacific Islands in excess of Australian postage costs. Subscriptions and inquiries should be addressed to the Course Secretary, The Post-Graduate Committee in Medicine, Herford House, 188 Oxford Street, Paddington, N.S.W.

ST. VINCENT'S HOSPITAL, SYDNEY: GASTRO-ENTEROLOGY UNIT.

A MEETING of the Gastro-Enterology Unit of St. Vincent's Hospital, Sydney, will be held on July 27, 1961, at 5.30 p.m. Dr. E. Sibree will speak on "Some Aspects of Gastritis". All medical practitioners are invited to attend.

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED JUNE 24, 1961.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.	Australian Capital Territory.	Australia.
Acute Rheumatism	..	1	..	1	..	1	2	..	5
Amœbiasis	..	..	..	..	..	..	..	..	..
Ancylostomiasis	..	..	..	..	..	..	2	..	2
Anthrax	..	..	..	..	..	..	..	..	..
Bilharziasis	..	..	..	..	..	..	..	..	..
Brucellosis	..	..	..	..	..	..	..	..	..
Cholera	..	..	..	..	..	..	..	..	..
Chorea (St. Vitus)	..	..	..	..	..	..	..	..	..
Dengue	..	..	..	..	..	..	..	..	..
Diarrhœa (Infantile)	1	3(2)	2(2)	..	..	..	14	..	20
Diphtheria	..	..	..	..	..	..	..	..	..
Dysentery (Bacillary)	..	..	1(1)	..	1	..	..	..	2
Encephalitis	..	..	..	..	..	..	..	..	..
Filariasis	..	..	..	..	..	..	..	..	..
Homologous Serum Jaundice	..	..	..	..	..	..	..	..	..
Hydatid	..	..	..	..	..	..	..	..	..
Infective Hepatitis	117(31)	79(46)	23(6)	25(19)	4(1)	7	..	5	260
Lead Poisoning	..	..	..	..	..	..	..	..	..
Leprosy	..	..	..	..	..	..	..	..	..
Leptospirosis	..	..	2	..	1(1)	..	..	..	3
Malaria	..	..	..	..	..	..	..	..	..
Meningococcal Infection	..	..	..	..	..	..	..	..	..
Ophthalmia	..	..	..	..	..	..	7	..	7
Ornithosis	..	..	..	..	..	..	..	..	..
Paratyphoid	..	..	..	..	1(1)	..	..	..	1
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	1	1	1(1)	3(3)	..	1(1)	..	..	7
Puerperal Fever	..	..	1	..	..	..	..	..	1
Rubella	..	12(7)	..	2(2)	..	..	..	..	14
Salmonella Infection	..	..	..	..	2(1)	..	..	..	2
Scarlet Fever	5	9(8)	2(1)	5(4)	..	1	..	..	22
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	..	..	1	..	..	..	..	..	1
Trachoma	..	..	..	124	..	..	..	..	124
Trichinosis	..	..	..	..	..	..	..	..	..
Tuberculosis	23(14)	27(19)	22(4)	1(1)	3(2)	..	..	..	76
Typhoid Fever	..	..	..	..	..	..	..	..	..
Typhus (Flea-, Mite- and Tick-borne)	..	..	1(1)	..	..	..	..	..	1
Typhus (Louse-borne)	..	..	..	..	..	..	..	..	..
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] Figures in parentheses are those for the metropolitan area.

SURGICAL SEMINAR AT ST. VINCENT'S HOSPITAL, SYDNEY.

A SURGICAL SEMINAR will be held at St. Vincent's Hospital, Sydney, on Monday, August 7, 1961, at 5.30 p.m., in the fifth floor lecture theatre. Mr. O. H. Schneider will speak on "Mesenteric Vascular Occlusion". All medical practitioners are invited to attend.

SEMINARS AT SYDNEY HOSPITAL.

Change in Programme.

AT the seminar to be held at Sydney Hospital on August 23, 1961, at 2 p.m., Professor J. E. Caughey, Associate Professor in Neurology, University of Otago, New Zealand, will speak on "The Myopathies". The seminar by Dr. David Edwards previously set down for that date will be given in September instead.

University Intelligence.

UNIVERSITY OF MELBOURNE.

Elections to Council and Standing Committee of Convocation by Graduates.

NOTICE is hereby given that nominations will be received up to 4 p.m. on Monday, September 18, 1961, to fill five vacancies for the representatives of graduates on the Council of the University of Melbourne and 20 vacancies for the representatives of all Faculties on the Standing Committee of Convocation. Nomination forms may be obtained from the Returning Officer.

Notes and News.

Surgeons and Chest Physicians for Indonesia.

The Indonesian Ministry of Health has asked the Australian Government's assistance in recruiting surgeons and chest physicians who are willing to work in Indonesia under a short-term contract (three years) or under the Volunteer Graduates Scheme. Those interested can obtain further information from the Higher Appointments Office, Commonwealth Employment Service, in their nearest capital city.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Roncevich, Allan Leonard, M.B., B.S., 1960 (Univ. Sydney), 132 Warriewood Road, Warriewood.

Mooy, Myles John, M.B., B.S., 1960 (Univ. Sydney), Mater Misericordiæ Hospital, Pacific Highway, Crow's Nest.

O'SULLIVAN, Dudley Joseph, M.B., B.S., 1960 (Univ. Sydney), St. Vincent's Hospital, Darlinghurst.

The undermentioned have applied for election as members of the South Australian Branch of the British Medical Association:

Kaines, Anthony Hannay, M.B., B.S., 1961 (Univ. Sydney), Queen Elizabeth Hospital, Woodville.

Johns, Rhys Ivor, M.R.C.S., L.R.C.P., London, 1946, Box 1, Hawker.

Jonas, Oswald, M.B., B.S., 1958 (Univ. Adelaide), 2 Tafquin Street, Springbank.

Renton, Robert, M.B., Ch.B. (Univ. Edinburgh), D.O., 1950, 172 North Terrace, Adelaide.

Diary for the Month.

JULY 25.—New South Wales Branch, B.M.A.: Hospitals Committee.
JULY 26.—Victorian Branch, B.M.A.: Branch Council.
JULY 27.—South Australian Branch, B.M.A.: Scientific Meeting.
JULY 27.—New South Wales Branch, B.M.A.: Branch Meeting.
JULY 28.—Queensland Branch, B.M.A.: Council Meeting.
AUGUST 1.—New South Wales Branch, B.M.A.: Organization and Science Committee.
AUGUST 2.—Western Australian Branch, B.M.A.: Branch Council.
AUGUST 2.—Victorian Branch, B.M.A.: Branch Meeting.
AUGUST 3.—South Australian Branch, B.M.A.: Council Meeting.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney): Medical Officers to Sydney City Council. All contract practice appointments in New South Wales. Members are requested to consult the Medical Secretary before undertaking practice in dwellings owned by the Housing Commission.

South Australian Branch (Honorary Secretary, 80 Brougham Place, North Adelaide): All contract practice appointments in South Australia.

Editorial Notices.

ALL articles submitted for publication in this Journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations, other than those normally used by the Journal, and not to underline either words or phrases.

Authors of papers are asked to state for inclusion in the title their principal qualifications as well as their relevant appointment and/or the unit, hospital or department from which the paper comes.

References to articles and books should be carefully checked. In a reference to an article in a journal the following information should be given: surname of author, initials of author, year, full title of article, name of journal, volume, number of first page of article. In a reference to a book the following information should be given: surname of author, initials of author, year of publication, full title of book, publisher, place of publication, page number (where relevant). The abbreviations used for the titles of journals are those of the list known as "World Medical Periodicals" (published by the World Medical Association). If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full data in each instance.

Authors submitting illustrations are asked, if possible, to provide the originals (not photographic copies) of line drawings, graphs and diagrams, and prints from the original negatives of photomicrographs. Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary is stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: 68-2651-2-3.)

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this Journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such notification is received within one month.

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